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Volume 16 Number 6

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The Physiotherapy Review

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The Making of Splints

Coralynn A. Davis

A most important part of the early care of our paralytic patients is the proper splinting of paralyzed limbs. Securing temporary splints to maintain the position ordered by the physician has been difficult. Most of our patients are not able to pay for braces made by a brace-maker; funds for that purpose have not been easily obtained. The wooden boxes and wire mesh splints which we formerly used did not always keep the limb in the required position and were bulky and cumbersome. Occasionally we found a tinsmith willing to make a splint from wire and galvanized tin, that served the purpose very well, but tinsmiths were not willing to bother with what seemed to them "odd jobs" when they were busy.

After seeing the splints used elsewhere, some of the Visiting Nurses in Physical Therapy thought that they, themselves, could bend wire and make splints which would meet their needs. Anne Prochazka of our own group has contributed more than anyone else to the designing and improving of such splints. Every nurse working with these patients is now able to plan splints to fit the patient's needs.

A brief outline of the method used in measuring the patients for splints, as well as in the making of them, may be of some help to other physical therapists who face similar problems.

Directions for the Measurement of the Posterior Wire Leg Splint

First Method:

Place a piece of wrapping paper under the leg to be splinted. Fold the paper at the heel and bring it up at right angles at the sole of the foot. Outline the leg and foot on the paper, beginning about two or three inches below the pubes. Hold the pencil in a vertical position in order that the outer surface of the leg will be outlined. Mark off points indicating the top of the splint where the thigh will rest, the knee bend, the ankle bend, and the length of the longitudinal arch. When the paper is removed, the distances between these points can be measured.

Second Method:

Record the following measurements:

Length of leg

1. From two to three inches below pubes to point of knee bend.
2. From knee bend to heel.

Width of leg

1. Across thigh where edge of splint will rest.
2. At knee.
3. At largest part of calf.
4. At ankle.

Length of foot

1. From heel to great toe—allowing one inch for toe protection.

Width of foot

1. At toes.
2. At heel.

Designate whether right or left leg is being measured.

Procedure in Making of Posterior Wire Leg Splint

1. Tools and supplies: (See Fig. 1.)

Galvanized wire No. 9	Tape measure
Vise	Broom stick
Cold chisel	Adhesive tape
File	Measurements for splint
Hammer	Pencil and paper for calculations

2. Determine the amount of wire required for skeleton splint:

2 leg lengths (total) + 2 foot lengths + thigh width + toe width + 14 inches allowed for loops at heel, bends, and overlapping of wire. Straighten out the amount of wire calculated and cut off with cold chisel or file. (See Fig. 2.)

3. Measure off about one-half leg length of wire (so that overlapping will be in the middle of the splint) and make right angle bend in vise. Mark off thigh width and make second right angle bend in the same plane. (See Fig. 3.)

4. Measure total leg length and mark wire with file. Place broom stick in vise and hold wire at marked point. Bring wire around stick at this point making first heel loop. The wire emerges from the loop at right angles to start the foot plate. From the loop measure off a length of wire equal to the foot length and make a right angle bend to form top of foot plate. Then measure foot width and make another right angle bend for the other side of the foot plate which is now in a plane perpendicular to the leg piece. Place broom stick in vise again, slipping heel loop No. 1 on broom stick. After measuring and marking on wire the foot length, proceed to bend the wire around the stick as before making another and similar heel loop. (See Fig. 4.)

Assistant Supervisor, Physical Therapy Nurses, Visiting Nurse Association of Chicago.

Fig. 1

5. Bring the ends of the wire together, measuring so that the two sides of the splint are of the same length. Hold them firmly and fasten with adhesive tape. The skeleton splint thus made may now need some straightening and manipulating to make it assume its proper shape. (See Fig. 5.)

6. It is now necessary to reenforce the skeleton splint at ankle and thigh, at the same time providing knee supports. First determine the length of wire needed as follows:

Ankle reenforcement and knee support: 2 ankle to knee lengths + 2 foot lengths + foot width + 17 inches allowance for knee supports, bends, and overlapping.

Fig. 2

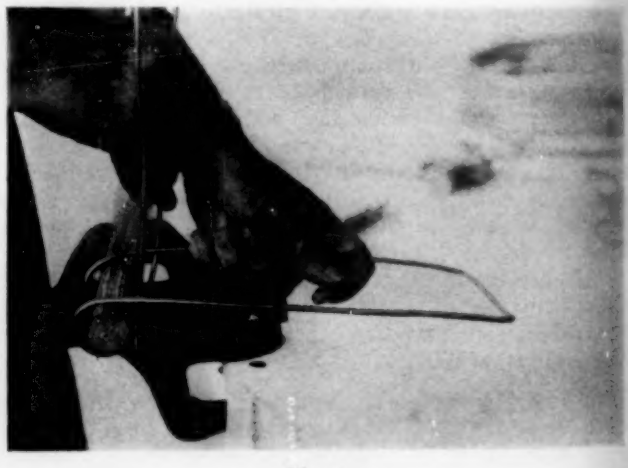

Fig. 4

Fig. 3

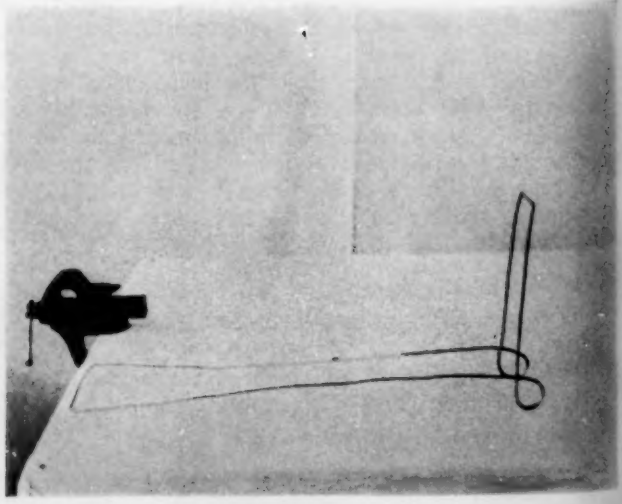

Fig. 5

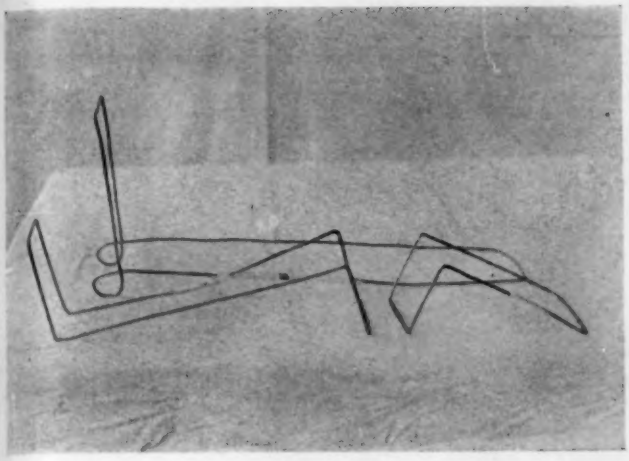

Fig. 6

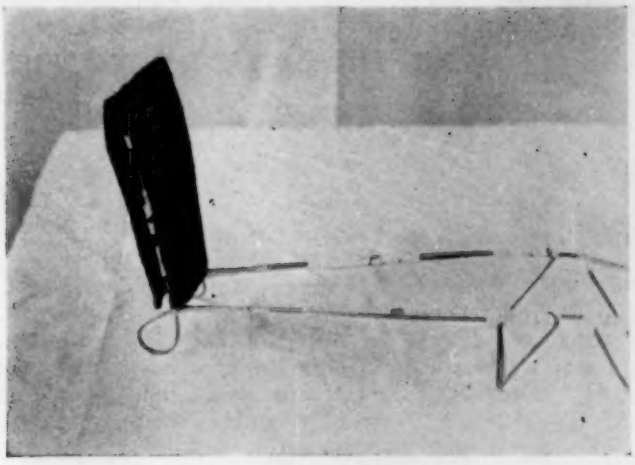

Fig. 9

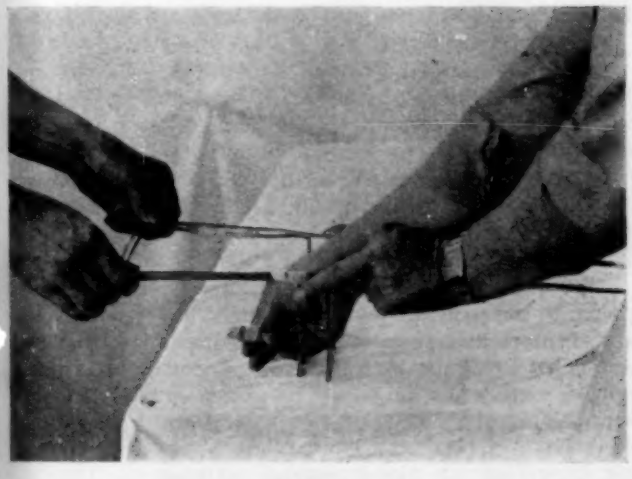

Fig. 7

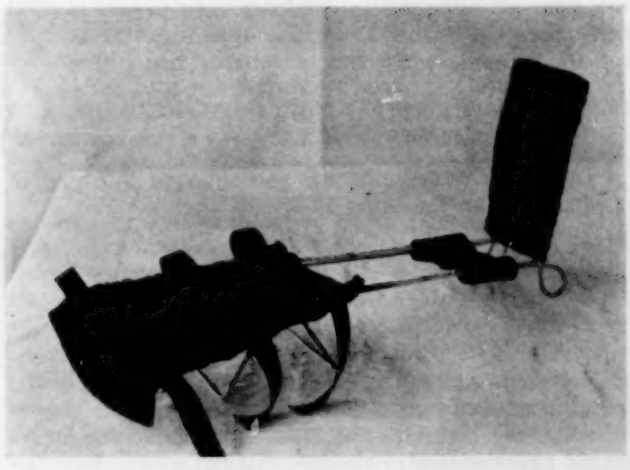

Fig. 10

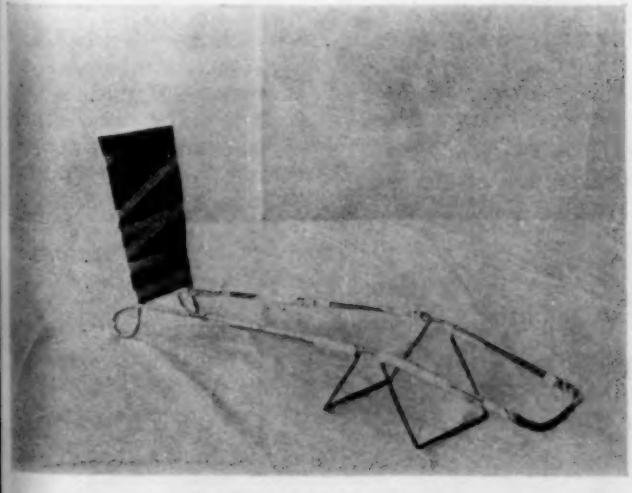

Fig. 8

Thigh reenforcement and knee support: 2 knee to thigh lengths + thigh width + 17 inches allowed for knee support, bends, and overlapping.

Bend wire for reenforcements, making angles correspond to brace angles. The reenforcement of the foot plate need not be as long as the foot plate itself. Knee supports are usually about three or four inches long and the same width as the splint at the knee. Overlapping should occur along leg lengths. Reenforcements are then fastened with adhesive where wire overlaps. (See Fig. 6.)

7. Attach the splint reenforcements to the skeleton splint with adhesive, being sure that the bends coincide with each other. This can be done easily if another person holds the wires firmly while the adhesive tape is being applied. (See Fig. 7.)

8. Shape the thigh piece to conform to the shape of the leg at the thigh by bending it around a pipe. Then put the desired bend at the knee, adjusting the knee supports to steady the splint in the correct position. Bend the heel loops out so that the splint will not roll. The next step is the placing of the cardboard on the foot plate to make a solid surface for the bottom of the foot. Two

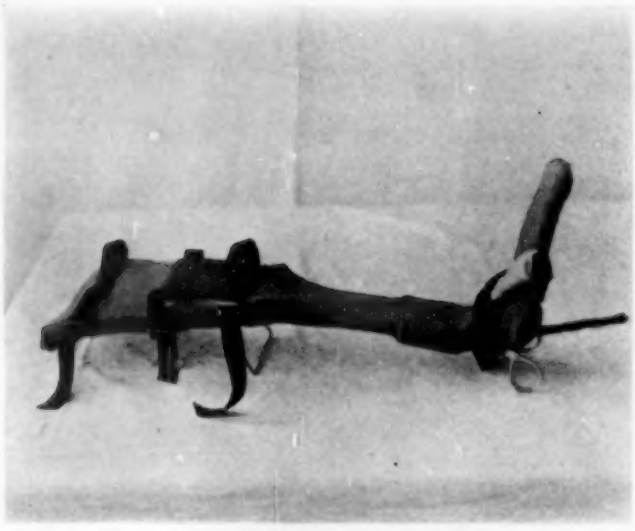

Fig. 11

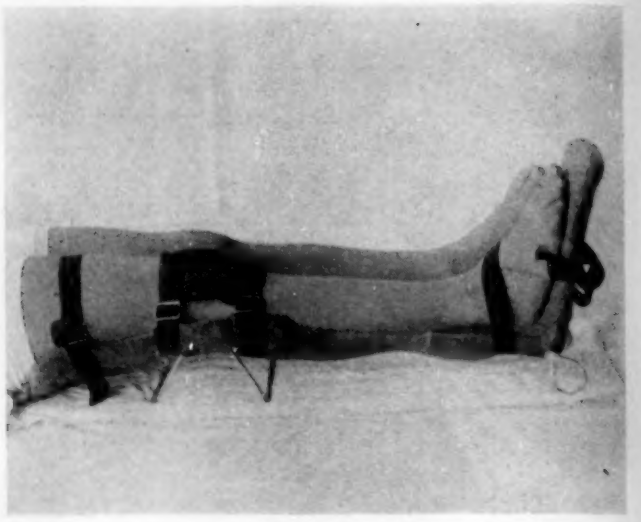

Fig. 12

pieces of cardboard are cut to the measurements of the foot plate and strapped on either side of the wire framework with adhesive tape. At this point the heel portion of the foot plate is drawn together with the tape to conform to the ankle width measurement. (See Fig. 8.)

PADDING AND FINISHING THE POSTERIOR WIRE LEG SPLINT

1. We now come to the padding and finishing of the splint. The following materials are required as is also shown in Fig. 1:

Felt for padding	Scissors
Webbing	Tape measure
Buckles	Stocking
Needle and thread	Chamois

Cut the felt to fit the foot plate and split it almost to the top. Place over either side of the foot plate. Insert under the top layer on the inner side of the foot plate another pad the size of the longitudinal arch. Sew felt together at the edges and the extra padding will serve to support the arch when the splint is applied. (See Fig. 9.)

2. Pad the splint under the thigh and to three inches below the knee with felt. Another felt pad is used at the angle, allowing the heel to be free. Straps of webbing may be inserted through the layers of felt at the thigh and above and below the knee at this time if desired. (See Fig. 10.)

3. Pull a cotton stocking over the entire splint cutting holes for knee loops, knee supports and where webbing and buckles are sewed. Make a webbing strap for ankle long enough to form a figure eight around the splint at the ankle. Make a knee cap from a square of felt and sew straps above and below the hole at the patella. Pad webbing with felt or chamois where it is likely to irritate the skin. (See Fig. 11.)

4. Figure 12 shows the finished splint correctly applied to the patient's leg and adjusted to give the necessary comfort and support. If the patient has a strong tendency to roll the leg outward, a piece of broomstick eight or ten inches long may be placed in the wire heel loops. This gives a broader heel base and prevents the splint from tipping. When splints are worn on both legs, they may be wired together to keep the legs abducted or to prevent outward rotation of the hips.

Quilting such as is used for bed pads may be substituted for felt in padding the splint. Muslin bandages may be used instead of webbing and buckles to hold the splint in place.

The period that marks the end of the Middle Ages showed but little progress in the evolution of medicine; medical ideas did not progress beyond the concepts of Galen. In physiology knowledge was still primitive. A few great men perhaps based their diagnoses on positive facts, but in general the practitioner made his deductions from the simple inspection of blood and urine. Bleeding was the principal remedy in all cases thought to be due to plethora. The application of cups, leeches or of the cautery was much in favor.—*FRENCH MEDICINE, by M. Laignel-Lavastine and M. Raymond Molinery.*

Neurologic Principles in the Treatment of the Spastic Child

J. L. Fetterman, M.D., M.A.

Introduction

In a broad sense the term spastic child designates a youngster handicapped by a muscular disorder in which some or many muscle groups are tightened or overcontracted. Such muscle groups, which are in a state of tension or increased tone, interfere with function to a degree almost as severe as a flabby, toneless muscle.

The basic disorder is a disturbance in the motor system characterized by an incoordination or imbalance. Along with the spastic state of the muscles, there are a variety of tremors and other involuntary movements ranging from twitching of muscle fibers to major choreiform and occasionally severe dystonic twists and torsions of the entire body. This combination of spasticity and tremors causes serious interference with the use of the hands, and also results in a stiff, stumbling gait.

Spasticity results from a change to those centers in the brain whose function it is to regulate and coordinate muscular activity. Smooth performance depends upon the relaxation of one group of muscles, say the extensors, when the flexors are contracted. Otherwise there would be fixation, rigidity, or ataxic movement. The centers for voluntary control are in the pre-Rolandic cortex. The areas for coordinated muscle tone are in the basal ganglia of the sub-cortex. Associated with these is the cerebellum and other mid-brain ganglia (Substantia Nigra, Corpus Luysii etc.).

Types of Spastic Disorders

There are many individual forms of the spastic disorders of childhood depending upon the extent of the muscular imbalance, the cause, and the associated features. If the involvement is confined to one arm, we use the term monoplegia. If one arm and the corresponding leg are affected, the condition is one of hemiplegia. When both lower extremities are affected, the designation is diplegia. If all four extremities should be involved, the diagnosis is quadriplegia.

A distinction is likewise made as to whether or not the major defect consists of a fixation of muscles, or rigidity, or if tremors dominate the picture. Where involuntary movements of a repeated wave-like character are present, the term choreo athetosis is used.

Among the important causes of spasticity are lesions of the brain before or at birth. In many cases the cerebral defect is congenital or developmental. The next important cause is birth trauma. Brockway, in an analysis of a thousand cases of spastic disorder, found that some thirty percent were caused by difficulties of labor. He mentions such factors as severe suction produced by sudden negative pressure, strangulation by the cord around the neck, disproportion between the fetal head and the maternal pelvis, etc. The mechanism of the cerebral damage during labor is quite uniformly a hemorrhage upon or within the brain. Such hemorrhage may leave its permanent marking upon the delicate nervous structures.

10515 Carnegie Avenue, Cleveland, Ohio.
Read at the Semi-Annual Meeting, Ohio Chapter of the American Physiotherapy Association, October 17, 1936.

Next to the two major causes comes the factor of an infection elsewhere. Practically any of the contagious diseases of infancy and childhood may be complicated by an encephalitis. In rare instances even vaccinia has been complicated by severe encephalitis in which spastic features followed. There are a few cases produced by congenital syphilis; or trauma after birth, such as those caused by falling out of a cradle or down steps.

Associated Defects; Mental Impairment

Thus far we have stressed the motor activity inasmuch as the spastic and tremulous muscles appear to be the chief problem of the spastic child. More serious, even if less visible, is the loss or impairment of those mental faculties which decide motor action. The vital point in the therapeutic success of any spastic child is more often the degree of mental development rather than motor difficulty.

Lesions in the nervous system are rarely discrete; they are often widespread. Thus in the spastic child, the lesions extend beyond the motor cortex and into other areas. In many instances the speech centers are involved, producing some types of lack-of-word understanding or expression. In several cases which were examined at the Association for the Crippled and Disabled, we have found speech difficulty ranging from a slight dysarthria to an almost complete loss of power to use or understand words. One child was practically unable to laugh or cry. In one series, the number of cases of speech defect reached over fifteen percent. Other less common disorders include difficulty with vision and hearing. In many cases the disturbance is not focal but affects the total functioning of the brain and results in an intellectual impairment.

Earlier writers, among them Sachs and Hausman, emphasized the frequency of mental defects among spastic children. These authors reported a study of two hundred and twenty-five children in whom some thirty-five percent were idiots. More recently, a psychologist, Miss Lord, by a new battery of tests, found that the percentage of serious mental defect was not as great as expected. Some children appeared extremely retarded because they were inaccessible. In several of the children who were thought to be backward, her detailed tests revealed normal or even superior intelligence. She stated that there was no definite parallel between the extent of motor difficulty and the mental state.

A study of sixteen spastic children done in our clinic by Miss Margaret Barnes showed a range from the extraordinarily low I.Q. of 19 to an I.Q. of 107. Of the sixteen children studied, five rated mentally as average.

Problems of Treatment

Theoretically the ideal approach would be the removal of the cause. This ideal is rarely attainable. In only a few instances can the neurosurgeon find a focal lesion which can be successfully corrected at operation. These consists of adhesions or cysts which the surgeon can remove. In a case of congenital syphilis, B.B., the spastic features were relieved by thorough antiluetic treatment.

In most cases direct treatment is impossible and we must employ those measures which will assist the crippled, spastic child to adjust itself to society. Within the scope of such a program, there is needed not only a neurologist but even to a greater degree, the orthopedic surgeon, the psychologist, and the physical therapist.

THE ROLE OF PHYSICAL THERAPY

Though the basic defect is in the brain, much may be done to assist the child towards better motor function and indirectly to help the spastic child towards a more useful life.

The first attention of course must be directed to the spastic muscles. You are all familiar with the various techniques employed in physical therapy. They are heat, massage, passive movements and exercises, activity in a pool or to the rhythm of music. These are measures which may relieve muscle tension and facilitate coordination. Proper relaxation and training in walking are procedures which are beneficial.

At the Orthopedic Hospital in Los Angeles, the department of physical therapy is in charge of teaching relaxation, rhythm of motion, and gait training. At the Association for Crippled and Disabled in Cleveland, such techniques employed by Miss Dean and Miss Lorrilliere have resulted in amazing progress in some instances.

In addition to the treatment given to the involved muscle groups, the spastic child should be educated and encouraged in the use of those physical and mental faculties that are undamaged. Just as Helen Keller made use of the sense of touch as a compensation for her blindness and deafness, so other handicapped children may be encouraged in the used of those faculties which are unimpaired.

THE MENTAL TREATMENT OF THE SPASTIC CHILD

A child with an obvious defect is at a serious disadvantage psychologically as well as from the anatomic handicap. The world is cruel to the cripple. Jeering and laughing are an expression of the sadistic tendency latent in mankind. The crippled child secludes himself in a wall of loneliness from such humiliating attacks. It must therefore be the function of all of us to encourage a more humane attitude on the part of society and more especially to help the spastic child to face the world rather than to withdraw into a shell.

There are several ways of helping the crippled child psychologically. Take for example the youngster who had suffered a serious, extensive osteomyelitis for which ultimately an amputation of a leg had to be done. Following the amputation, Steve was seen hobbling around on crutches, a broad smile on his face. His courage and cheerfulness were amazing. Later he expressed his mental attitude as follows: "I was heartbroken when my leg came off and felt that life was no longer worthwhile. I consulted my priest and he told me. 'Steve. don't be so disappointed. The Lord may punish us by illness but often he selects us as he did his own Son as a sacrifice for others.' I was made to feel that my illness was helping mankind." This may be an unusual example of where a handicap may serve an individual advantageously.

It is possible to minimize the evaluation of handicap either by contrast with a previous disorder or by a comparison with the difficulties of others. One of my patients, A. S., is barely able to get about even with the aid of a brace and a crutch because of a multiple sclerosis. Despite this serious physical handicap, her manner is pleasant, smiling and hopeful. Miss S. explains her bright outlook as follows: "Some years ago before this trouble, I had a nervous breakdown. I suffered great tortures. When I recovered from this mental difficulty, I developed a physical one. However serious my crippled state may have appeared to others, to me it is minor in contrast to what I suffered before."

The foregoing examples have occurred in adolescent or adult cases. It is less easy to influence a youngster in the same manner but we can do much through the medium of the mother. A child frequently mirrors the emotional state of the mother.

The third approach, namely, that of distracting attention from the handicap and directing the interest to other activities, is valuable for both children and adults. If attention can be directed towards a goal, then the selfconsciousness, fear and resulting tension produced by the disability may be minimized or disregarded. The interest should be directed towards constructive, useful activities. In a formal way this is the function of occupational therapy.

During my childhood, a friend fell from a high precipice and sustained an injury to the head and spinal cord. There resulted a combination of spastic and paralytic phenomena involving chiefly the legs. The youngster, A. W., spent many months in the hospital, underwent a series of operations, and finally was able to walk with the aid of braces. During our boyhood, A. W. was unable to participate in various games of swimming, running, or baseball. Instead of bemoaning his difficulty, he spent a good deal of his time reading. At first he read "joke books" more or less as a compensation for his difficulty. Later he wrote and told stories. By the time of our adolescence, Albert was the most popular boy in the group because of his ability to tell humorous stories. Now as an adult, he has written a most successful book. Albert's attention was rarely self-centered, and either through personal ability or through the aid of his family, he was able to concentrate successfully upon other interests.

Lord Byron, though crippled, became a great writer. Dostievsky, though epileptic, was one of the leading novelists of all times. Dr. Carlson, in spite of a serious spastic handicap, has become a prominent physician.

These points are mentioned to physical therapists because it is my belief that every treatment has its psychic echo or reverberation. Whether a doctor prescribes a pill or physical therapy manipulation, there is a change in the treated individual not only local but psychic. If the influence be good, the person thus treated develops a self-confidence, a loss of fear; he himself is inspired with the will to work. He can tap the reservoir of latent energy and thus achieve much more than he was thought capable of. This alone can explain the instances of remarkable improvement in walking which have been accomplished at the Association for the Crippled and Disabled. Through the medium of massage, passive and active motion, the child was encouraged to use his motor apparatus, which has been inactive because of fear, self-consciousness, and uncertainty. The physical therapy treatment proved to be excellent psychotherapy.

Every treatment which you give not only has a local effect but a wider and more important influence upon the mind of the child or adult treated. The removal of fear, the encouragement to strive, the confidence in success, as well as the freeing of frozen muscles, is within the scope of physical therapy. The problem is formidable but not futile.

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A Broader View of Muscle Training

Janet B. Merrill

We are all realizing the need for more thought and a wider outlook in regard to muscle training and other forms of therapeutic exercise.

We feel that a broader program may be combined with our original emphasis on localized exercises and should be carried out with the same caution in observing the fundamental principles of prevention of fatigue and avoidance of exercises which tend to produce or accentuate deformity that we have formerly used.

Those of us whose work lies in hospitals and with the bedridden may perhaps feel that these broader activities lie outside our field. We may not be on the lookout as much as we might for opportunities to widen the scope of our treatment in order that we may help our orthopedic patients to make the most of their abilities to participate in normal activities after the initial period of disability and extreme caution is past.

The achievement tests which Miss Sheldon has devised and made a part of the physical education work at the Branch Brook School for crippled children in Newark are a notable example of one way of thinking of the crippled child as an individual and not merely as an animated muscle chart. Why should not all of us who are working with any type of chronic disability make more of a point of finding out the particular things in the daily lives of our patients which are a handicap? Many times we could help them to overcome the obstacle if we realized its existence, either in matters of convenience or independence, or in preventing participation in forms of recreation which might be possible for them but from which they are now barred.

An outgrowth of the adult education and WPA projects has been the organization of recreative groups for the crippled and handicapped. These are directed for the most part by instructors whose own training has been along the lines of the activities which they are teaching, with at best a theoretical rather than a clinical knowledge of the pathological conditions they are handling. There seems danger of their unknowingly, with the greatest enthusiasm and best of intentions, doing harm to their pupils.

Those of us who had a physical education background for our physical therapy work were trained to teach sports, dancing and swimming. We realize the value of these activities to ourselves and regret our inability to keep them up as we would like to for our own good. Surely we should not forget the value of these same activities to those of the handicapped who might be able to participate in them if properly guided, nor should we forget the danger of having them taught to the crippled by instructors who do not realize the possibility of increasing deformity and weakening muscle power even in chronic conditions of long standing. We should try to do our part in this work.

A recent discussion of new techniques and methods of treatment in the orthopedic departments of state and visiting nurse associations showed that the public health nurses are fully awake to the opportunities for broadening their service to their patients.

Dr. Legg's figures showing the continued gain in muscle power in old poliomyelitis cases under treatment should encourage all of us to continue our work with weakened muscles. We must realize however that there must be added interest in the exercise as the years go on, a definite and attainable incentive to work for, a record of something accomplished (such as may be shown by quantitative tests which can be made at intervals if it seems inadvisable to use them in daily exercise periods), or pleasure in the activity itself.

Perhaps the teachings of this hospital have tended to have a narrowing effect on the work in other places. We have been so convinced of the evil effects of fatigue and of general exercises which would tend to produce deformity and over-develop the stronger muscles at the expense of the weaker, that we have preached localized muscle training for paralysis cases to such an extent that there may be some who think our outlook is limited by such phrases as "side lying, knee extension." Perhaps we may have been over-cautious in our teachings, but we still believe that these principles are fundamentals which not only precede the general work but must always underlie whatever broader activities may be added to them later.

As a matter of fact, we have tried to teach our poliomyelitis patients to be independent (walking, sitting and rising, climbing stairs and curb stones, the problems of feeding and dressing), as soon as the time came when it was felt that additional activities would not be disadvantageous to their progress.

We have devoted some time to the very complex problem of teaching some of them to swim and have learned that it is a very difficult matter to adapt strokes in such a way that the repetition of the movements will not produce over-balanced muscles and accentuate deformities. This leads us to teach the dangers of swimming, particularly with instructors who have not had much experience with paralyzed muscles. It does not prevent us from going ahead with swimming instruction to those patients for whom suitable strokes can be devised.

As anyone who has worked with Miss Trainor in the Neurological Ward knows, the physical therapy of those patients includes not only the development of the antagonists of spastic muscle and so-called coordination and balance exercises, but a training which aims to teach the child to be independent in caring for himself, and includes playground activities and handicrafts as well.

In the clinic with our orthopedic cases we have not thought much about recreative work. Nearly all of our children go to school, except for a few months of early disability, and we are not as conscious of the individual who has never learned to play as are some observers now working with crippled adults. Possibly these older patients may have been more isolated in youth, due to a

Children's Hospital, Boston, Mass.

Read at the Reunion, Children's Hospital and Courses for Graduates, Harvard Medical School, Physiotherapy Course, June 20, 1936.

lack of facilities for early treatment such as are now becoming increasingly available. Certainly in schools there is an opportunity for the physical therapist to assist the handicapped child to find play activities in which he can participate, always with the restriction in mind that they must not be such as will tend to increase his disabilities later on. There are many adults who can be taught to take part in some sport, and we should be alert to help them. Often some gadget or adjustment which we can suggest would make it possible for them to grasp the necessary objects. There are some very ingenious and simple gadgets now available.

There has been a difference of opinion as to the value of using rhythmical exercises and working to music in the attempt to strengthen weakened muscles. Probably maximum effort of a particular muscle group cannot be obtained as well by this means. Other patients who have less need of localized work would benefit greatly from the balance and smoother coordination of muscle action which are gained from dancing. Some who must walk with aid can dance without other support than that which a careful partner can give and will gain in strength in hip, knee and trunk muscles from the repetition of the steps. The first instruction may be done in the sitting position, in the early stages of learning the steps and keeping time. Care must be observed in teaching the weight-bearing positions of the foot, as dancing positions are not always suitable for weakened feet. Overfatigue should be guarded against, and the length of the lesson gauged by the muscle fatigue as in any other form of exercise.

The value of slow music and rhythmical exercise for obtaining relaxation in pathologically spastic groups must, like all other measures, be judged by the success obtained in its use with each case.

Another field for the physical therapist lies in preventive work directed toward better body mechanics for normal children. This is being carried out by means of instruction to the parents of small children in the Pediatric Clinic of the New York Hospital, by Miss Miriam Sweeny, who was formerly in charge of the work at this hospital, and who with Dr. Sever gave the first summer courses.

Dr. Osgood recently advised that the physical therapist should know more about occupational therapy. We think we all know the desirability of that. There is a need for someone to make a careful analysis, from the physical therapist's viewpoint, of the muscle action in the various activities taught. This should be done with the limbs in positions of common deformities as well as in the normal. The same sort of analysis should be made of different sports to assist in selecting suitable ones for our cases; here is an opportunity for two worth-while books.

As we branch out and enlarge the scope of our work, we must be careful not to lose sight of the fundamental principles of treatment for the disabilities of our patients and to allow ourselves to be carried away with enthusiasm for newer activities which by their emphasis on holding the patient's interest cause us to neglect the things which are necessary for his ultimate welfare. An old saying often quoted by Dr. Lovett in his teaching is still worth keeping in mind. It went something like this. "What are you trying to do? Is it worth doing? Are you doing it?"

The Early Treatment of Poliomyelitis and the Importance of Physical Therapy

Arthur T. Legg, M. D.

I. Benefit of long period of after-care is twofold, as it results in

A. Prevention of deformities.

B. Regain of muscle power.

II. Notes on the period after the acute stage.

Orthopedic treatment begins when the acute stage is over; at this time contractures must be prevented by keeping the affected part in neutral position. *Warning:* In immobilizing legs and arms neutral postions must not be held continually, as that results in stiffening of joints. (Example: In one case, solid plasters were kept on both legs for six months; when these were taken off the knee joints had become very stiffened.)

Associate Professor of Orthopedic Surgery, Harvard Medical School.

Read at the Reunion, Children's Hospital and Courses for Graduates, Harvard Medical School Physiotherapy Course, June 1936.

Method of immobilizing:

A. For legs, posterior wire splints or bivalved plasters are used. Advantage: They hold legs in neutral postion, but can be removed easily. These may be removed with benefit twice a day.

B. For deltoid and arms, wire splints are used.

C. For trunk muscles, a corset is used.

III. Notes on the sensitive stage.

A. To shorten sensitive stage, hot wet packs and hot baths should be given twice or thrice daily for fifteen minutes. Note: Moist heat is more effective than dry heat; e.g., before sensitiveness is over, the Hubbard Tub has been used (temperature 100 to 104 degrees).

B. Rest is essential.

C. No muscle activity should be allowed.

IV. Procedure after the sensitive stage.

A. Complete muscle examination is given.

B. Muscle training is started. Note: Guard against fatigue of muscles as this leads to weakening.

Advantages of under water treatment of poliomyelitis:

1. Influence of gravity and friction is eliminated by the buoyancy of the water, and hence exercises are done more readily.

2. Hence, the patient has a sense of accomplishment, and his interest and activity are stimulated.

3. The range of activity is wider with this than with table exercises.

4. Body balance is learned more easily.

5. Walking is practiced much earlier, which benefit is transferred to out of water activity.

C. Frequent muscle examinations are necessary, for one group of muscles may regain power over its opposing group, and cause unbalance. For example, complete muscle examination may be given every month for four months; every two months for two examinations; every four months for five years, and every six months thereafter.

D. Walking in cases with leg involvement.

1. Cases with moderate weakness and making constant gain in muscle power should be kept off feet for nine or ten months. Otherwise they will overdo, and hence show loss of muscle power from fatigue.

2. Cases with moderate or extensive weakness and showing little or no regain or power should have braces even after six or seven months.

(Note: Physician should supervise a case of poliomyelitis, even if the case has been given to a physical therapist.)

It may interest you to know that we have seen five patients in the Harvard Infantile Paralysis Commission Clinics, who have undoubtedly had two attacks of the disease.

V. Note: Following these is presented the information collected from clinic cases concerning the amount of benefit to be derived from a long period of aftercare. We wish to emphasize that long continued treatment prevents deformities and results in gain of muscle power.

We use the 1927 onset cases. A total number of 496 was reported to the Harvard Infantile Paralysis Commission Clinic. Of these, by January 1, 1934, there were:

A. Discharged or left practically normal or normal	167	or 33.6%
B. Not normal (discharged or left)	68	13.7
C. Dead, moved, or other treatment	97	19.7
D. At Harvard Infantile Paralysis Commission Clinic	164	33.0
	496	100.0%

VI. Of those under treatment at the Harvard Infantile Clinic, only 53 were non-operative, and hence show measurement of muscle power.

A. These cases are divided according to treatment:
1. Good
2. Medium
3. Poor

B. Muscles are graded as follows:

Normal	muscle is graded as 0 paralysis
Good	muscle is graded as 1 paralysis
Fair	muscle is graded as 2 paralysis
Poor	muscle is graded as 3 paralysis
Trace	muscle is graded as 4 paralysis
Gone	muscle is graded as 5 paralysis

For example, total number of muscles of legs and trunk equals 46. If each muscle was graded as "gone," the total paralysis equals 5 times 46, or 230.

G. Graphs* are used to exemplify our statement that long continued treatment prevents deformities and results in gain of muscle power.

Graphs 1-3 show that

a. As soon as treatment is lessened, muscle power is weakened.

b. Returning these cases to steady treatment results in a gain in muscle power, even in the ninth year after onset.

Graph 4. Shows increased muscle weakness during the first year with no treatment. This, though unusual, is contrary to the general opinion that all cases improve at first regardless of treatment.

Graph 5. Shows that good treatment steadily for nine years results in steady gain in muscle power.

The fifty-three cases were averaged to make Graphs 6-9. These exemplify:

a. The importance of long continuous treatment.

6. Over a period of nine years, legs and trunk improved on an average of 75 percent, arms 80 percent.

7. Over a nine-year period, the average paralysis of legs and trunk dropped from 25 percent at onset to 8 percent at conclusion. Arms dropped from 20 percent to 6 percent.

8. Cases of various types of treatment show various percent improvement over nine-year period for legs and trunk.

a'. Good 81%
b'. Medium 74%
c'. Poor 53%

9. Similarly for arms
a'. Good 85%
b'. Medium 62.2%

b. The importance of immediate good treatment.

8. First year—legs and trunk improved
a'. Good treatment 61%
b'. Medium treatment 48%
c'. Poor treatment 44%

9. First year—arms improved
a'. Good treatment 75%
b'. Medium treatment 49%

Note: There is some spontaneous recovery of muscle power due to the disappearance of the oedema of the cord. There is probably no spontaneous recovery after six months.

VII. Conclusion: While the greatest rate of gain is in the first year, with treatment, real progress can be made over a long period of years.

*See Jour. A. M. A., 107:9:633, Aug. 29, 1936.

Physical Therapy in the Psychoneuroses

Robert A. Matthews, M. D.

Physical therapy has many uses and can be advantageously utilized in practically every branch of medicine but it is likely that we, as physicians, do not always take advantage of the many benefits it has to offer or use it as extensively as we might. Its value in certain organic diseases is well known but it also has its place in the treatment of functional nervous disorders. However, its relative position in the therapeutic management of such conditions is frequently poorly understood and occasionally it is actually abused.

Before discussing how physical therapy may be applied in the treatment of the psychoneuroses, or as these conditions are sometimes called, the minor psychoses, it may be well to consider briefly the nature of these diseases and their relative importance in the general field of medicine. The psychoneuroses are said to constitute sixty to seventy percent of medical practice. They are of tremendous social significance and probably produce greater social and economic loss than do the major psychoses. The psycho-neurotic is often poorly understood and not intelligently handled. This at times perpetrates a grave injury to the patient since the unwise management of a neurosis in its incipiency may so fix the illness in the patient's mind that later treatment proves of no avail, even though it be of the very best type. Continued and repeated concentration by physicians on some portion or organ of the body without thought of the psychological factors involved may do lasting harm.

A psychoneurosis is usually manifested by the development of some physical symptom or symptoms, which at least in the beginning are not based on a definite organic disturbance, although the symptoms may closely resemble those produced by a specific disease. Sometimes the symptoms may be of a general and poorly defined type, but in all cases the illness is based either wholly or in part on psychological factors. The psychoneurotic individual remains in good contact with his environment; he is usually able in a way to carry on his daily life, although he may be seriously handicapped by his symptoms. The patient knows that he is ill, although frequently he has no real understanding of the essential nature of the illness and is apt to believe that he is suffering with a grave physical disease. However, we now know that a psychoneurosis usually develops as the result of some conflict in the patient's mind, produced because certain trends or forces from without or within the individual cannot be reconciled with their ethical standards or the demands of reality. These conditions arise from a multiplicity of causes, some of them—such as difficulties in the environment and everyday life of the patient—are near the surface; others lie deep in the personality. As Myerson puts it, the psychoneuroses arise from physical disease, from the bad habits of modern civilization, from the complexities of sex, from the conflict of instincts with morals, from fatigue, jealousy, envy, lust, love, idealism, selfishness—from the bewildering warp and woof of life and human constitution. Some are born neurotic, some achieve neurosis, and some have neurosis thrust upon them. Some are born neurotic and from the beginning face life with lowered endurance, with fear and undue sensitiveness. Whether or not early training is at fault, they show an emotional irritability even as young children, periodically wear themselves out, are hyperaesthetic, and trifles mean too much to them. Some achieve neurosis,—those who too diligently pursue fame, wealth and pleasure. Too centralized a purpose with not enough pleasure brings collapse of energy; stimulii fail through monotony. Drifters, seeking pleasure, waste their energy, become bored, cynical, and neurotic. Queerly enough, scratch too loud an optimist and you find a neurotic whistling to keep his courage up. The hurried noon-day meal, the continuous bombardment with stimulii such as books, movies, and speed, brings about a tetanus of our energies as does the fierce unending competition in non-essentials—keeping up with the Joneses. Some have neurosis thrust upon them,—those who are not allowed to recover from a physical illness, who are too soon out of bed from childbirth; the poor, or the people well endowed with emotion who have to live and work in a monotonous and uncongenial environment, wives yoked by conscience and custom to disgusting husbands, husbands bound to petty, unreasonable, nagging wives,—the square pegs in round holes. Sex and its complexities are potent factors in the production of the minor mental diseases.

The classification of the psychoneuroses is not entirely satisfactory. They seldom present clear-cut symptoms, and there is much overlapping among the various types. We generally recognize four main types: (1) neurasthenia, those patients in whom fatigue and hypochondriasis are outstanding manifestations; (2) psychasthenia, which is composed of the compulsive and obsessive states and the specific phobias; (3) the anxiety neuroses, including simple anxiety states and a condition known as anxiety hysteria; and finally (4) major hysteria, in which we place those individuals with a basic hysterical type of personality and the patients in which the conflict is converted into some physical symptom such as a paralysis of an extremity.

We can find a use for physical therapy in each of these conditions. In neurasthenia the patient commonly complains of great and constant fatigue, a general sense of inefficiency, inability to concentrate, uncertain memory, fear of insanity, irritability and mild depression. There may also be and usually are symptoms associated with certain of the bodily organs and systems, particularly the alimentary tract. The individual may have a loss of appetite, indigestion, gaseous eructations, nausea, even vomiting and frequently constipation and diarrhea. There may be a consciousness of the heart activity with palpitation of the heart. Sometimes the respiratory system is involved and there may be a feeling of shortness of breath. Commonly the patient complains of peculiar sensations in the head and headache, particularly in the frontal region or at the base of the skull. There may be pain almost any place, dizziness and in-

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somnia. These patients are often ill-thriven individuals, undernourished and pale, with flabby musculature and a mild degree of anemia. Although the difficulty is primarily psychological, there is secondarily a poor physical condition and much can be done to improve the patient's mental outlook, to increase his courage and produce a sense of well-being by making every effort to improve his bodily health to the maximum degree. Physical therapeutic measures are definitely of value; massage, ultra-violet irridations, tonic cabinet baths, hydrotherapy (such as Scotch douches), all are useful measures and should not be overlooked. Constipation can sometimes be aided by sinusoidal currents and a number of other types of therapy are indicated according to the individual case. In the second group, those patients suffering with psychasthenia with compulsions and absessions or fear states, the individual is usually extremely tense, tremulous and agitated. Much can be accomplished by the utilization of sedative types of physical therapy. Many of these patients find that massage gives them at least temporary relief from some of their tensions, and sedative hydrotherapy—even the continuous tub—can be beneficially utilized. In the anxiety states, those individuals who have a fear of impending disaster or disease and who very frequently have symptoms specifically directed toward some organ such as the heart, with the belief that it is about to stop, are almost always under great emotional stress and feel tense and unhappy. They frequently suffer with insomnia, and many times massage at bedtime or a sedative tub bath of proper temperature controls their sleep difficulties more effectively than do sedative drugs. In hysteria, physical therapeutic measures are frequently indicated. The major hysteric, in whom at the present day we not infrequently encounter a basic intellectual defect, is not infrequently impressed by rather gross psychotherapeutic measures such as static electricity, strong faradism, etc., or during an hysterical outburst may be quieted by a cold pack or other hydrotherapeutic procedures. In the hysteric with conversion symptoms, such as an individual with an hysterical paralysis, in which there seems to be some dissociation in the mind of the patient with a blotting out of consciousness of the knowledge necessary to initiate voluntary motion in the part, it may be possible to reeducate the patient to use the part by means of faradic and galvanic stimulation. The individual can be shown that the part actually can be used and by getting him to voluntarily help with the movement as produced by the application of the electrical current, he can learn again to carry out the motion without outside aid. The patient who has an hysterical anesthesia, in which a portion of the body — sometimes exactly one-half of the body—is insensitive to pain, can be made to regain an awareness of the part in consciousness by the generous application of electric stimulii.

An example of how such physical measures can be made use of is that of a fourteen year old high school girl whose father is dead and whose mother is struggling hard to give this child and her brother a satisfactory education. The child, who is quite intelligent, was extremely anxious to please her mother by making a good showing in school. She stood near the top of her class but wanted to lead it at the termination of her freshman year. She did not achieve her goal but came out third, thus falling short of the self-imposed goal which was a great disappointment. While at a hairdressers during the last few days of the school term, she observed another girl who was suffering with chorea and who exhibited numerous choreiform movements of her extremities. The patient was quite upset by this experience, a few days later became emotionally disturbed and began to exhibit marked bazaar movements of the right hand and arm. She was unable to control these movements sufficiently to write. Her mother sent her away to the country for the summer. While there she was under the care of a physician who rightly diagnosed the condition as functional in origin and prescribed sedatives which were helpful to a degree. However, when it was time to return to school, the movements were still too severe to permit her to write legibly and there was considerable weakness in, but not a complete paralysis of, the extremity. The patient was then referred to a neurological clinic where a thorough neurological and mental examination was made. The functional nature of the illness being ascertained, the mother was assured that the condition was not organic in origin and the patient appraised of our interpretation of the difficulty. She was assured that she would be able to use the arm as formerly and regular treatments in the form of galvanism and massage prescribed. The patient was shown that it was possible to produce complete movements of the part by the use of electrical stimulii and requested to voluntarily aid the movement. There was rapid and progressive improvement with complete recovery within a month's time. Although the physical therapy was by no means solely responsible for the cure since psychotherapy in the form of reassurance and suggestion with some intellectual approach to the problem was utilized, galvanism and massage were useful adjuncts to treatment and hastened the return of normal function.

As formerly stated, physical therapy can be employed usefully in almost any of the psychoneurotic conditions and in this article is indicated very briefiy some of the specific forms of treatment that may be prescribed. Many of the methods of therapy have not been touched upon. It might be well to mention the value of teaching the neurotic good body posture since it may aid digestion, improve intestinal elimination and increase efficiency. Massage is one of the most valuable forms of treatment at our disposal and in this regard Pemberton has said, "There is probably no other measure of equal known value in the entire armamentarium of medicine which is so inadequately understood and utilized by the profession as a whole." Massage does much for these people because it can be utilized as a substitute for exercise and in certain debilitated cases it may be even superior to exercise. Light pressure massage produces instantaneous but transient dilatation of capillaries and aids in the production of a hormone-like substance (acetyl-choline) which has been found to be therapeutically useful in certain nervous conditions. Massage is said to stimulate the formation of red blood cells and since there is often an accompanying anemia in these cases, it is helpful in overcoming that condition. The effect of massage should of course be either mildly sedative or slightly stimulating but never exhausting. External heat can sometimes be used in conjunction with massage and enhances its value. It in itself tends to reduce agitation, tenseness and insomnia. Dr. S. Weir Mitchell used physical therapeutic measures in conjunction with his famed rest cure in the treatment of neuroses, utilizing electric light baths, hydrotherapy, massage and graduated exercise. Ultra-violet therapy is thought to improve calcium metabolism and has a tendency to lower blood calcium which some authorities believe is elevated in certain conditions such as the depressions. It is now used in conjunction with a drug called hematoporphyrin (Trade name: Photodyn) which renders the individual

more sensitive to light and which has recently been found beneficial in the treatment of certain types of depression. The effect of the drug is enhanced by the use of generalized ultra-violet irridations, but the light treatments must be administered with caution since the individual, while taking the drug, shows a tendency to burn more readily.

Various other types of electrical treatments can be utilized as they appear to be adapted to the needs of the individual case and need not be dealt with here. Hydrotherapeutic measures have previously been mentioned. It might be well to comment at this point on the fact that hydrotherapy in this country is not being as extensively taught or utilized as it might well be. Few institutions or hospitals, other than those for the treatment of mental diseases, have hydrotherapeutic equipment, and most of the schools of physical therapy are not teaching this valuable branch of the subject.

Colonic irrigations may be mentioned for the purpose of condemning them since in most instances it has been shown that they have little real value, may be definitely harmful, and constitute at best a colonic irritation rather than an irrigation. This procedure should be used only when there is some positive and definite indication and should not be administered for the psychotherapeutic effect alone.

It should be borne in mind that almost every form of treatment known to medical science carries with it certain psychotherapeutic components. This is particularly true when any physical means is employed in the treatment of disease and may be exemplified by the fact that for centuries it was believed that the laying on of hands was a cure for the "King's Evil," hence the pilgrimages to London or places where at certain times of the year the King "touched" individuals suffering with scrofula. These psychotherapeutic implications should not be overlooked but should be recognized for what they are, and made use of. This is aided by being certain that the procedure is appropriate for each individual case. Treatments should always be carried out with the greatest care and precision. The therapist should believe in what he is doing and for this reason it is of the utmost importance that there be a complete understanding between the physical therapist and the physician. Should the physician prescribe one form of treatment and the therapist have another idea as to the proper procedure, it is likely that the patient will become aware by a chance remark or in some other way of the lack of understanding or disagreement between the persons responsible for his care. Since all psychoneurotic individuals are sensitive and alert to anything pertaining to themselves, great care should always be exercised to avoid making careless remarks within the hearing of the patient which he could in any way misconstrue.

Another feature of physical therapy which should be considered is the time-consuming element. Many psychoneurotic individuals, particularly if they are being treated in an institution, have a great deal of time on their hands and find it difficult to make use of the many hours of the day in a constructive manner. Physical therapy treatments can be utilized to take up a portion of the patient's time in a healthy manner and hence they should never be hurried.

Lastly, but by no means the least important phase of the matter to be considered, is the fact that we should always clearly and honestly evaluate what is expected of the treatment. Seldom if ever can physical therapy be solely depended upon to effect a cure of a psychoneurosis because it cannot get to the root of the problem which of course lies in the patient's personality. Physical therapy can be considered only as an adjunct in the treatment of these conditions which we have discussed, but we feel that it is a most valuable adjunct and should always be given its rightful place in the therapeusis of the functional nervous diseases.

At the end of the Middle Ages, baths, with details carefully prescribed, held a large place in therapeutics. Drugs were composed for the most part of vegetable substances. A remedy which had an exaggerated vogue for centuries was the "theriacum" or "triacum," invented by Nero's physicians. Its basis was the flesh of vipers, regarded as an excellent remedy against all poisons. ••• Mud baths were highly regarded in the Gallo-Roman period, and *Barbottan, Dax* and *Saint-Amans-les-Eaux* were among the most frequented; for traveling was common in those days and it was evident that these movements of the people had health as their chief aim.

In addition to the well-known strategic and commercial routes were the secondary roads which contemporary studies have clearly established by the discovery of their milestones. The existence of fords also has marked in a definitive way the passage of the travelers both modest and luxurious, as can be determined by the translation of the lapidary inscriptions that are found here and there. People entertained each other and amused themselves also in these baths, and theaters were appreciated just as in our own days. In Paris, the ruins of the baths of Julian the Apostate, which still exists today beneath the Cluny Museum, bear evidence to the grandeur of Rome.—*FRENCH MEDICINE, by M. Laignel-Lavastine and M. Raymond Molinery.*

What Is Normal Posture in Children?

Katharine F. Wells

For many years teachers of physical education have been trying to improve the posture of children. Interest in posture is universal. We can pick up almost any issue of the *Journal of Health and Physical Education,* the *Physiotherapy Review,* or *Hygeia,* and find an article on the subject. Such articles usually deal either with the necessity for posture instruction or with means for making instruction more effective. There is comparatively little material on the subject of the normal posture of children. Probably the majority of people have assumed that this did not differ materially from the normal posture of adults. When one considers the nature of physiological development, however, it does not seem probable that, for instance, the normal posture of an eight year old child can be the same as the normal posture of an eighteen year old boy or girl. It would therefore seem that a consideration of the normal variations which occur with the growth and development of the child is fundamental to any study of the posture of children. When such considerations are made, one discovers that certain so-called "defects" are normal to the young child, and that, under normal conditions, these gradually disappear as the child progresses to another stage of development. The question immediately arises, "When is a defect not a defect?" Or, in other words, "What is normal posture in children?"

Our initial problem, then, would seem to be to come to some sort of an agreement regarding the definition of normal posture at the different age levels, or better still, at the different stages of physiological development. It is unfortunate that the leading specialists in orthopedics and pediatrics have not given us more help regarding this problem, and that even they have failed to come to an agreement on the subject. In fact, some of them do not seem to make allowances for chronological variations at all. In a book written on the posture of pre-school children, the normal posture for this age is described in the same terms that are usually used for defining the normal posture of adults. The maintenance of the normal curves of the spinal volumn are stressed and winged scapulae and prominent abdomen are spoken of as posture faults. By such a standard it would be practically impossible to find a pre-school child who did not have faulty posture.

In a recent study made by the writer in an attempt to devise an objective method of grading the posture of children of elementary school age, five hundred photographs of children were graded subjectively by eleven judges, these judges representing the fields of orthopedics, pediatrics, physical therapy and physical education. According to the general trend of the grades given by these specialists there was a consistent improvement in posture from the age of six to the age of thirteen. Yet, in answer to a questionnaire, some of these same judges said that it was normal in young children for the scapulae to be tilted and abducted, the lumbar curve to be exaggerated, and the abdomen to be prominent. Obviously, in spite of their stated beliefs, when it came to giving actual grades to young children, they marked down for the very characteristics which they had admitted were normal. There seems to be a sad discrepancy between theory and application. If this is true of specialists, how much more so of the average physical therapist and physical education instructor.

A study of recent literature helps to throw a little light on the subject of chronological variations. In the second chapter of Phelps and Kiphuth's book, *The Diagnosis and Treatment of Postural Defects,* the statement is made that, "in the pre-adolescent child, a prominent abdomen, associated with a lumbar lordosis and a slightly flattened chest, is not a postural defect." According to this we should not expect to find flat abdomens among children until the twelfth or thirteenth year. This is much later than the age given by other authorities. A government bulletin, entitled, *Good Posture in the Little Child,* puts the age of the flattening of the abdomen at five or six. Schwartz, Britten and Thompson, in their *Studies in Physical Development and Posture,* say that, "at the beginning of life there is a protuberance of the abdomen that disappears by about six years of age." Dr. Andrew R. MacAusland of Boston considers five to seven the average age for flattening to occur, but suggests that it may be postponed until nine or ten in some cases without being considered abnormal. We have, then, an age range of eight years—from five to thirteen—for the "normal" flattening of the abdomen. With such marked differences of opinion, is it any wonder that our conception of the normal posture of the pre-adolescent child is somewhat hazy? A prominent abdomen in a small child is unquestionably not a posture defect. It is a well known fact that the fluid diet of infants, the proportionately large liver and the slow adjustment of the abdominal muscles to the vertical position, with the ensuing problem of gravity, are logical reasons for large and protruding abdomens. The age at which there is no longer a legitimate reason for the abdomen to be prominent is, indeed, a question. To the writer's mind, however, the *type* of abdominal prominence in children is more significant than the *degree.* Some abdomens show a general, evenly distributed convexity from the chest to the pubis. This, unless it is very extreme, is probably the normal type for young children. The type of prominence in which the abdomen bulges out at the level of or below the navel is not found in normal posture at any age. This is the so-called "pot-belly" type and is usually associated with muscular weakness and faulty nutrition.

In regard to other phases of posture, especially the chest and shoulders, it is difficult to find much information. Bancroft tells us in her classic book, *The Posture of School Children,* that the chest is barrel-shaped during infancy and that the transition to the broad, flat type of chest takes place during the pre-school and early

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school years. During the time that the chest is barrel-shaped, it is impossible for the scapulae to lie flat on the back, the back itself being convex. They are seen, therefore, to lie more on the sides of the chest. When the chest changes its proportions the scapulae draw closer together and eventually lie flat on the back. If they fail to do this by the time the chest has lost its infantile shape, it is usually due to an increased dorsal convexity or to undeveloped muscles of the back and should be regarded as a posture defect. The exact age for the completion of this change is a somewhat variable factor, but generally speaking it should have occurred by the close of the pre-adolescent period. In some types of posture, however, the inferior angles of the scapule may be prominent, not because of any mal-position of the scapulae themselves, but because of a long lordosis extending to the neck. This results in a pulling away of the spine from the level of the scapulae and a consequent protrusion of the inferior angles.

During the adolescent period the spine acquires the curves of the normal adult spine. It is at this time that posture faults are most likely to develop, and it is especially difficult to distinguish between real defects and a retarded transition to the adult posture. This is by far the most important age period from the point of view of giving posture instruction and correction, because it is during this period that posture traits are in the process of becoming deep-seated habits.

To return to the question raised at the beginning of this paper, "What is normal posture in children?", it will be seen that it has by no means been answered. The purpose of the paper has been, rather, to call the reader's attention to the question and to arouse his interest in it. We hope that it may, eventually, in the not too distant future, be given a satisfactory answer. Meanwhile, we shall probably continue to "guide children in the way they should go" without being quite sure just what that way is.

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Ionization

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The subject of ionization covers such a large field that time and space will not permit details. However, let us consider just a few brief facts:

1. Little is known of the nature of electricity; we are here concerned only with its effects.

2. Electricity exists everywhere and in all matter but in such distribution that we are not aware of its existence.

3. There is no creation of electricity, although such expression is used, because we alter its distribution either in excess or deficit, calling these alterations "positive electricity" or "negative electricity."

4. The terms "current" and "static" do not mean varieties but ways in which it can be manifested; namely, static being produced by friction, bringing about a redistribution of electricity. If two conductors at different potentials are connected, the difference of potential will be equalized and a current of electricity will flow. Continuous currents of electricity can be obtained by mechanical, thermal or chemical methods.

5. The physiological and therapeutic action of electricity is due to the chemical or physical changes taking place in the human tissues. This process can best be understood by the passing of an electrical current through pure water and water containing salts. It will be noted that the current will flow in the solution containing salt and will not in the pure water. A soluble acid or sodium hydrate will also permit the current to flow, while albumen, or other soluble protein, starch or dextrose free from salt, will not permit its flow.

There are three methods by which electricity produces therapeutic effects through chemical changes. First, the production of chemical bodies at the entry and exit of the electrical current in and from the body; these bodies have a caustic reaction and are used to destroy diseased tissue. We call this 'surgical ionization.' It may be mentioned that surgical ionization may be produced at either the positive or negative poles. The sodium hydrate having a caustic action forms at the negative electrode while a hydrochloric acid forms at the positive electrode. Either may be used for the destruction of the tissues. Warts or moles are removed in this manner.

Secondly, we have a rearrangement of ions along the path of the current through the tissues.

Thirdly, the introduction of ions from without. This is termed "medical ionization." By ionization, then, is meant the passage of ions into tissues or the exchange of ions which can be made to take place within the tissues as a result of the application of the galvanic current. This current must be led to and from the body by suitable conducting paths, electrodes and connecting cords. One cord from the positive and the other from the nega-

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tive pole of the apparatus. The electrodes may be called "active" and "dispersive." The active electrode conveys the galvanic current of that polarity which has been selected to accomplish a given result. The dispersive electrode is one whose surface is so great, compared to the active, that its purpose is to carry the current that is not needed in the treatment away from the body. Other names for the dispersive electrode are "inactive" or "indifferent."

The skin tolerance is about 2 ma. per square inch of surface. Ulcerative surfaces will tolerate 4 ma. per square inch. When one uses 25 ma. of current at the active electrode, the dispersive pad should have a surface area of at least 25 square inches. From 25 to 50 ma. of current, the surface area should be at least 50 square inches. However, it must be remembered that the skin tolerance varies in different individuals. The resistance of tissues of the human body varies. For example, the resistance of the mucous membrane is lower than that of the skin; or, after the current has passed through the skin, the resistance is lower in the underlying tissues.

To illustrate the above, the following technic was used in an ionization treatment for a patient suffering with arthritis of both knees. This patient's knees were flexed to about 90 degrees and pain was so severe that she could scarcely stand the weight of sheets or covering. The physician ordered ionization with Histamine 1-2500. The technic was as follows:

1. The patient was made comfortable in a recumbent position.
2. A large warmed dispersive electrode previously soaked in NaCL was placed under the back of the patient and attached to the negative pole of the machine.
3. The Histamine ointment was smeared over both knee joints. Flannel bandages moistened in NaCL were wrapped around the knees to about ¼ inch thickness. Electrodes of equal size were applied to each knee. Electrode foil was used, for it can be cut to fit whatever area is to be treated. The bifuricated cord was attached to the electrodes and connected to the positive pole of the machine.
4. The galvanic current was slowly increased in intensity, using 20 ma. for the first treatment, 30 ma. for the second treatment, and 50 ma. for the following treatments.

In four treatments the swelling was reduced. After ten treatments the patient was practically free from pain and both knees could be extended to almost normal. Eighteen treatments of 30 minutes each were given. At the end of this time the patient could flex and extend the knees normally and without pain. The Histamine treatments were discontinued and baking, massage and exercise were introduced. In the use of Histamine ionization treatment, a drop in blood pressure of 10 to 20 points takes place. Care must be taken to watch for symptoms such as flushing of the face, headache, feeling of fullness in the head, and rise or fall in pulse rate. If severe reaction occurs, the current should be turned off slowly and the treatment discontinued for that time. Treat the patient as you would in shock. In the use of Mecholyl this is not so likely to happen, as this drug has little effect on blood pressure. An increase in flow of saliva is noted.

In the treatment by ionization, careful consideration must be given the patient. Important points to observe in technic are:

1. Attention to the comfort of the patient, that the parts to be treated are well supported.
2. Clothing should be removed to prevent being soiled.
3. The skin examined to make sure there is not an abrasion. Should this occur, either another field should be used or if this field is required a small pad of cotton covered with adhesive may be applied. The skin, if oily, should be washed thoroughly with soap and water, or cleansed with other preparations such as ether, etc. If dry, it may be moistened with NaCL or bicarbonate of soda solution so that the resistance may be more easily broken down.
4. Raise the intensity of the current slowly to break down the skin resistance and lessen the discomfort of the patient, usually taking about five minutes for this procedure.
5. The electrodes should be previously warmed and snugly applied.
6. If patient complains of burning sensation, turn the current off slowly and carefully readjust the application of electrodes.
7. Constantly watch the milliampere meter to be certain of a steady flow of current and to avoid a shock to the patient.
8. The patient must never be left alone during this treatment.

As to the advantages of the ionic method, the current will pass in every part of the tissues to be treated and only the therapeutically active ions are taken in. Another advantage is that the introduction of ions will be only in the region desired, while if a drug is taken by mouth it will be distributed to the entire body through the blood stream.

The ionic method also has its limitations inasmuch as only the superficial tissues receive the ions in numbers sufficient for therapeutic action. The deeper the part that needs treatment, the smaller the number of ions which will be introduced. The reason is this: that in entering the tissues some ions encounter the capillaries and lymphatics. Some will migrate through their walls and be carried away by the fluids. The same is happening in the larger blood streams lying in the deeper tissues. Again, some ions such as silver will combine with chlorine, forming silver-chloride and become insoluble and migration is impossible. It is believed that only a few millimeters are penetrated. The depth depends largely on the duration of the flow of the current, the electro-motive force and on the ions used.

It is therefore important to keep in mind all necessary factors to successfully administer ionization.

Points Along the Way in Examining, and Muscle Action

Mary E. Bushnell

ARE YOU CAREFUL to put pressure in direct line of muscle itself, when testing for resistance, or do you allow other muscles to enter in?

1. *Extensor Longus Digitorum* is a dorsiflexor, but has a tendency to evert. If pressure is given from dorsiflexion straight downward, the extensor hallucis longus and anterior tibial spring into action, often giving a "fair" extensor longus the credit of "good" power. From a position of slight eversion with the dorsiflexion, pressure should be applied downward and inward.

2. *Anterior Tibial* delights in leaning on the extensor hallucis longus. If the foot is not held in marked inversion and pressure given slightly outward, as well as downward, from inverted dorsiflexion, the tibial may steal some power from the extensor hallucis longus and appear better than it actually is.

3. *Posterior Deltoid.* In horizontal abduction, prone lying, the arm is often allowed to slip into adduction and if tested at this angle, the latissimus dorsi may become involved and cause some inaccuracy. The arm should be at right angle to the body and pressure applied directly in line of gravity.

ARE YOU FAIR to the muscle under examination by allowing for over-balance in leverage, caused by a stronger or contracted one?

1. A "fair-good" *Gluteus Medius* is often rated "poor" when tested for abduction in side lying, because the forward pull of a contracted tensor fascia lata throws the hip out of line, making it difficult for the gluteus medius to show the power it has—unless the hip is held forcibly straight.

2. *Gluteus Maximus* can be so held back by contracted hip flexors that it may be unfairly rated "poor" when mere lack of range is hiding its power.

3. *Anterior Abdominals,* though normal, may gain the appearance of being only "poor" or "fair" (and have been so rated) unless "poor" anterior neck muscles are taken into account or counteracted, because the leverage is made impossible by the backward drag of the head.

4. When adductors are very weak, a stronger gluteus medius may pull the thigh outward and thus throw it out of line so much, when the *Gluteus Maximus* attempts extension in prone lying, that fair power in the latter may be lost sight of, with its effort resulting only in feeble action.

DO YOU SHOW FAVORITISM

1. To the *Anterior Deltoid:*

(a) By allowing the arm to swing slightly forward as the patient attempts abduction in the sitting position? A "poor" deltoid has often been rated "fair" because of this, by taking power from the biceps.

(b) Giving it credit for the abduction performed by the supraspinatus? In back lying, a deltoid is apt to be graded "poor" on the strength of mere 25-degree abduction when there is actually only a "trace" of the muscle present, the motion being carried out to this slight extent by the supraspinatus.

2. To the *Middle Trapezius:*

By allowing "good" rhomboids to help and thus give a false impression of power? When the hand is placed at the neck, a supposedly "fair" middle trapezius often shows itself up as "poor" by being unable to fix the scapula to permit horizontal abduction of the bent arm even with help from the posterior deltoid.

3. To the *Quadriceps:*

(a) By allowing the leg to twist inward during knee extension in the sitting position? The tensor fascia lata has often been able to perform this action so well, in spite of a "poor" quadriceps, that it would be well to guard against over-estimation of power in the latter.

(b) By allowing the leg to twist outward during knee extension and so calling upon the sartorius for help.

DID YOU EVER:

1. See a *Posterior Deltoid* so low that it helped in adduction?

2. Try knee flexion in opposite side lying to strengthen the outer hamstring when weaker than the inner hamstrings?

3. Try having the patient sit with foot resting on the floor and rotate the lower leg and foot outward to bring the outer hamstring into action?

Harvard Infantile Paralysis Commission.
From the Scientific Exhibit at the Reunion, Children's Hospital and Courses for Graduates, Harvard Medical School Physiotherapy Course, June 1936.

The Interrupted Low Frequency and the Constant Electric Current in Medicine*

Currents belonging to this classification are widely used in medical practice and are unquestionably of value in the treatment of a limited number of conditions.

Since many machines on the market deliver several types of current, the most common types may be mentioned. The interrupted low frequency current may be unidirectional or alternating. The unidirectional currents include the ordinary galvanic current, which may be interrupted by various methods. The sinusoidal current may also be unidirectional, or, in other words, one-half wave of an alternating current is suppressed. The alternating currents of low frequency include the faradic and the alternating sinusoidal current. Turrell[1] and Kovacs[2] have described the various types of current in detail.

Interrupted Low Frequency Current

The theory of the action of interrupted low frequency current on the tissues is based on several well known chemical principles. Salts in solutions dissociate into positively or negatively charged ions, which are capable of conducting the electric current. The cell protoplasm contains in addition to the inorganic ions colloidal particles, which are in suspension or solution and which may themselves be electrically charged. When the current is passed through the tissues the electrochemical changes produced may stimulate nerves or cause muscles to contract. Since muscle contraction is easily produced by interrupted currents of low frequency, they are used to treat any condition in which the exercise of muscle by electrical stimulation is desired, as in certain diseases of the nervous system.

Electrical stimulation of muscles is usually employed with other valuable physical therapeutic agents such as dry heat, massage, muscle splinting and reeducational exercises. It has to be used with these other procedures intelligently or the use of electricity may prove definitely harmful. For example, in poliomyelitis, electrical stimulation improperly used may overfatigue the weakened muscle and stimulate the tone of stronger muscles, thus interfering with muscle balance. Experiments on animals by Chor[3] have verified the clinical observations on the harmful effects of electrical stimulation of paralyzed muscles in the early stage of impairment.

In peripheral nerve disease, electrical stimulation, by providing muscular exercise, may prevent atrophy and fibrosis of the muscle while the nerve is regenerating; but further experimental work is necessary before final conclusions can be made. Hartman[4] showed that, following treatment by galvanic stimulation, there was no material difference in the atrophy of muscles between the treated and untreated denervated muscles. Bourbon[5] advises the employment of galvanic stimulation in facial paralysis.

Galvanic stimulation is also used in the flaccid stage of hemiplegias (early), myelitis and other upper motor neuron lesions when the muscles are flaccid. Its use is of little value in combined cord sclerosis, progressive muscular atrophy and myasthenia gravis (Weisenburg and Alpers[6]). In cerebrospastic paralysis, Ryerson[7] and Gordon and Brown[8] are of the opinion that any form of electrical stimulation is contraindicated. Pollock[9] states:

"The only requirement of electrotherapy is that it shall produce a contraction of the paralyzed muscle. Obviously, this cannot be brought about by stimulation with the faradic current, as the duration of each shock is too short in relation to the changed chronaxia of the nerve and muscle. Galvanic current must, therefore, be used. It may be used in the simple form of a continuous current, or in the form of sinusoidal currents of various types of waves."

Faradic current is used to stimulate muscles that are poor in tone but have a normal nerve supply. It was formerly much used in exercising muscles in patients undergoing the Weir Mitchell treatment of the psychoneuroses. In such cases exercise and massage are probably of as much value. Painful faradic stimulation has also been used in hysterical individuals as a means of fortifying or inducing suggestion. Turrell[1] has emphasized the danger that can arise from the use of the faradic current because of its tetanizing effect. This can produce overfatigue and diminished blood supply in the muscle. Pollock[9] says:

"Sinusoidal current and other forms of wave currents have only the advantage of relative painlessness. There is a seeming advantage in the fact that at times a larger electrode is used and rhythmic contractions are produced in large muscle groups. This is a disadvantage and care should be exercised to stimulate only the paretic muscles."

The Constant Current

The constant, direct or galvanic current, in addition to being used for muscle or nerve stimulation, already described, is used to deposit the ions of certain salts in solution on or in the tissues. For soluble salts this process is spoken of as "common ion transfer." The term "electrophoresis" applies to the movement of colloid particles which are either electrically charged or have absorbed charged particles. The salts of heavy metals such as copper, zinc or tin are frequently used to moisten the electrodes, and the positively charged

*Council on Physical Therapy. Reprinted from Journal of American Medical Association, October 31, 1936.

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ions of zinc, for example, will move toward the cathode when the current is passed through the tissues. Locally these ions may produce precipitation of protein at one of the electrodes, depending on polarity, giving the effect of cauterization. This form of treatment has been used on the mucous membranes in the field of proctology, otorhinology and gynecology. The introduction of certain drugs into the tissues from which they may be absorbed into the blood stream and exert systemic effects offers another use of this procedure. The process just described has been referred to in the literature as "ionization," a term that is entirely erroneous. It is preferable to speak of this electrochemical phenomenon as "common ion transfer" or "electrophoresis," depending on the type of electrolyte employed. It is electrochemically incorrect and clinically misleading to speak of this method as "surgical ionization" when a caustic effect is desired and as "medical ionization" when drugs are introduced by this method for systemic effects.

It has been claimed that certain potent pharmacologic agents such as histamine may be introduced into the body by the constant current. A few reports concerning this matter have appeared in recent medical literature. These workers[10] are enthusiastic, but their work seems to lack adequate control. They also have expressed the belief that it produces a greater local vasodilatory effect in the joint over which it is introduced. This point can be little more than pure conjecture.

Kling[11] has used histamine by iontophoresis. He has expressed the opinion that this method is superior to the subcutaneous injection of the drug or to the effect of histamine ointment massaged into the skin. Kling has discussed the systemic reaction, which may be dangerous if the current is not properly controlled.

Kotkis, Melchionna and their co-workers[12] were able to demonstrate experimentally on dogs that the action of acetyl-beta-methyl-choline chloride introduced by common ion transfer was not a locally controlled reaction but a systemic reaction. They "undertook this experimental study on account of some very marked general reactions resulting from the routine clinical administration of acetyl-beta-methyl-choline chloride by iontophoresis in chronic arthritis." They claimed that the rapidity of action and duration of the effects varied directly with the intensity (milliamperage) and duration of the current. These reports would seem to indicate that this method of treatment may be suitable for certain circulatory or joint conditions, provided further controlled clinical studies give these same results, but that the method in the hands of the inexperienced is not without certain dangers.

The constant current may produce reflex vasodilatation by its stimulating action of sensory nerve endings. It may thus act on the skin like other counterirritants, such as a blister or ultraviolet radiation. Some believe that the constant current is superior to most counterirritants, because it can produce a gradual and more constant action on the skin without destructive effects.

Except in a few conditions, the recent literature would not give an unbiased reader the impression that in the fields of proctology, gynecology and otorhinology local destruction of tissue by this method has any particular superiority over other methods of treatment. As a matter of fact, few clinicians have compared the results obtained by this method with those obtained by other methods in the same type of case, so that evaluation from a strictly scientific point of view is difficult.

Electrolysis is used extensively in dermatologic practice. For hypertrichosis, exceedingly thin needles specially made for the purpose are obtainable. Some physicians prefer to use multiple needles. However, the majority prefer a single needle because of better control of result. The inactive positive electrode is of the sponge type; it should be wet with sodium chloride solution and may be held in the patient's hand.

MacKee[13] considers electrolysis to be the best treatment for the spider nevi. All that is necessary, he states, is to puncture the central dark spot with the point of the needle. There should be no scar. He states that in telangiectasia, when the vessels are small and not too numerous, they may be occluded as a result of electrolysis and that, if this is carefully done, there will be little or no scarring.

In the field of proctology a survey by questionnaire was conducted by the American Proctological Society in the year 1934. The purpose of this survey was to determine the value of physical therapy in rectal diseases. The results of this survey, reported by Kallet,[14] indicated that the use of the direct current, as already described, in proctology was very unsatisfactory and did not give as good results as other simpler and less time-consuming methods. Reports by Black,[15] De Bere[16] and Terrell[17] state that in hemorrhoids and pruritus the direct current is not a satisfactory method of treatment.

The use of common ion transfer of salts of heavy metals in gynecology is not as prevalent as it was several decades ago. Few reports appear in the recent literature. From theoretical considerations of the action of the electric current there is no doubt that cauterization of the mucous membranes can be accomplished by this procedure. The value of the method would depend on its safety, effectiveness and adaptability as compared with other methods used in the same type of case. Common ion transfer of copper salts in cervicitis is a method of cauterization which cannot be justly evaluated until further reports reveal how the results obtained by that method compare with those obtained in similar cases treated by surgical methods, the cautery or local drug cauterization.

In otorhinolaryngology, the same type of therapy has not only been more widely used in recent years but has found favor in the reports of many authors. The method is used in hay fever and allergic conditions, hyperesthetic rhinitis, intumescent rhinitis and chronic otorrhea. In rhinolaryngology, Hollander,[18] the Alexanders,[19] Volk,[20] Alden,[21] Démétriades,[22] Franklin,[23]

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Warwick,[24] Stovin,[25] Hurlburt,[26] Miller,[27] Cottle,[28] Tobey,[29] and Garfin and Pearl[30] feel that this method used on the nasal mucous membranes gives satisfactory results in the treatment of hay fever and rhinitis of allergic or vasomotor origin. Fibrosis of the submucosa of the nasal mucous membranes without permanent destruction of surface epithelium has been produced by common ion transfer of zinc salts. This has been proved histologically in both animal and man (Alden[21]).

It is questionable whether the effect of this method is anything more than a cauterization of the nasal mucous membrane. Schall[31] states that Palmer treated "a group of thirty patients with vasomotor rhinitis by a local application of concentrated phenol. The immediate effect of this treatment was exactly that which was obtained by the galvanic instrument of Warwick, in that the mucous membrane showed a grayish white discoloration followed by edema and obstruction with hypersecretion. Palmer had excellent cooperation from his patients, as they voluntarily permitted biopsies to be taken. The microscopic examination revealed that there was an increase in the connective tissue of the tunica propria with a diminution of the edema and vascularity. Of thirty cases treated by Palmer, twenty-four showed definite improvement and twelve were free from symptoms for periods of from three to nine months. . . . Fenton bluntly states that 'ionization as such does not do anything more than damage the mucosal tissues of the sinuses.'"

Most of these authors feel that proper case selection is essential to good results. Hollander[32] believes that the introduction of ionic zinc in allergic rhinitis is only palliative and not curative. The results obtained in seasonal hay fever, according to the same author, are less satisfactory, whereas in non-allergic nasal cases the results are excellent.

It would be highly desirable to know what is the consensus among allergists concerning the use of this method on the nasal mucous membranes in allergic disorders. The recent report by Duke[33] tends to throw doubt on claims made for the method, especially in the year 1933, when the amount of pollen in the atmosphere was much below the usual amount. The work of the Alexanders[19] suggests that the relief obtained by this method is due to the mechanical removal of antibodies from the nasal mucous membranes. They further contend that the results are better if patients have no reagins in the blood. The usual methods of treatment used by allergists are also not uniformly satisfactory or entirely free of danger. The conclusion reached by Hurd[34] concerning the entire question of this method in rhinolaryngology is conservative but not destructive. He is of the opinion that the method has not been used long enough at the present time for determination of its actual value and dangers. Ramirez[35] has reported disappointing results obtained by this procedure in the treatment of hay fever, but in the treatment of non-specific perennial vasomotor rhinitis the results have been satisfactory.

In otology sufficient evidence on the use of this method is not available to place it on a firm scientific basis, according to Hollander,[36] although he admits that it may be good in selected cases. It seems to be of the most value in treating chronic purulent otitis media or chronic otorrhea. Favorable reports have been made by Friel,[37] Granberry,[38] MacFarlan,[39] Jobson[40] and many others. Lierle[41] does not give the favorable and often enthusiastic report made by some of the other investigators. In the entire field of otorhinolaryngology, further work in the future will place this electrical method in its proper niche among the many therapeutic methods used.

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Although not a physician, Leonardo da Vinci qualifies with ease. He was the first great man of the new epoch, the Renaissance, and the most gifted man of history in both art and science. Truly he was a many-sided man with the broadest of intellectual horizons.

To know Leonardo only as a painter and sculptor is not to do him justice. Of direct importance to us was his work in anatomy, unknown to the world for three centuries. His drawings of dissections are so accurate and beautiful as to have led some to suspect incorrectly that they were copied by Vesalius. These same critics have also assumed that the text of the "Fabrica" was taken from the proposed (but apparently never published) treatise on anatomy by Leonardo. Although not the founder of modern anatomy, Leonardo was Vesalius' fore-runner—a St. John crying in the wilderness.

From the Northwestern University Medical School Founders' Day address by Dr. Leslie B. Arey, October 2, 1934.

Glycocol-Mecholyl Iontophoresis in the Treatment of Muscular Dystrophy

A. A. Martucci, M.D.

Recent investigations indicate that very little is known regarding the etiology of progressive muscular dystrophy, other than that apparently heredity plays an important part, as shown by the fact that the disease appears over several generations and many affect several members of the family.

The myelopathic paralysis or atrophy is a form of muscular atrophy in which the primary disease is apparently in the spinal cord. This type usually begins in the small muscles of the hands and spreads from the extremities to the trunk. Fibrillary twitching of the muscles is constant; the reaction of degeneration may be present. The disease is usually limited to adults and is of more interest to the orthopedic surgeon, because of the resultant deformities.

From the physical therapy standpoint, we are concerned with the myopathic form, in which the disease appears to be primarily of the nerve endings and the muscular fibers.

The myopathic paralysis or muscular dystrophy has a further classification:—

I—Erb or Juvenile type: There is an early involvement of the muscles of the shoulder girdle and upper arm with a pseudohypertrophy of certain muscles.

II—Pseudohypertrophic type: First affects the muscles of the calf and later causes atrophy of the musculature of the upper half of the body.

III—Facio scapulo humeral or Landouzy Djerine type: Early involves the muscles of the face, eyelids, and shoulder girdle.

IV—True hypertrophic type: The muscles are enlarged but there is considerable loss of power, and no atrophy present.

In general the above muscular dystrophies are characterized by progressive weakness of the muscles especially of the trunk and of the legs, associated with apparent hypertrophy of the calves, due in great part to a deposit of fat in the wasting muscles.

V—Amytonia congenita is included in the series. Begins in infancy and is congenital. There is weakness and loss of tone of muscles but without hypertrophy or atrophy.

In most instances the disease is transmitted through the mother, and it is more common in boys than in girls.

In the early stages, the patient complains of weakness. He walks with an awkward, shambling gait and climbs stairs with difficulty. There is usually increased lordosis and a peculiar swaying or waddle, inability to stoop; when regaining the erect position from a reclining one on the floor, they always use their hands for climbing, beginning at the ankles and working up to the thighs until erect position is obtained. Postural deformities occur and the disability is usually progressive.

Dr. Leonard Bender, Pediatrician at the Protestant Episcopal Hospital, Philadelphia, has been doing painstaking work and study for the muscular dystrophies, and has gathered cases throughout this city. The cases are of varied stages, beginning early in some cases and extreme in other cases. Dr. Bender's work on glycocol therapy in muscular dystrophies was published in the Southern Medical Journal, 1935.

It is in conjunction with Dr. Bender that we are able to present the newer and latest treatment by iontophoresis of glycocol and mecholyl.

The muscular dystrophy cases were taken from the service of Dr. Rutherford L. John, Orthopedic Surgeon to the Protestant Episcopal Hospital.

Through the cooperation of the following departments, complete study and care of the cases was made possible: the department of Pediatrics supervised the medical care; the orthopedics corrected by operating existing deformities; the physical therapy gave all the iontophoresis treatments together with other physical measures.

Treatment, originally, glycocol iontophoresis was reported by Dr. Rutenbech, 1934, which consisted of a gauze compress soaked in saturated glycocol solution. This was wrapped around the affected muscles and was covered with the positive electrode; the negative electrode was fastened to the other arm or leg. The current of 2 milliampheres was used for six to seven hours; in another case 20 milliampheres was used for three to five hours; in both cases objective and subjective improvements were noticed. In one case the disease was of ten years duration and glycocol by mouth had given little result.

In order to cut down the treatment time, we began investigating for a drug that would answer and solve this question. Mecholyl was used, and a solution consisting of a saturated solution of glycocol and 1-1000 solution of mecholyl—equal parts. The asbestos was saturated with this solution, then wrapped either to the calf, thigh, lumbar area, scapular or humeral areas, whichever muscles were involved. The positive electrode is attached to the asbestos, 15 to 20 milliampheres used for twenty minutes. The usual mecholyl reaction is obtained, rise in skin temperature for two to seven hours, slight sweating, redness, and a faster rate of capillary flow.

The use of mecholyl in combination with glycocol is that it not only enhances absorption of the glycocol, but due to the tremendous vaso dilatation obtained peripherally, the affected muscles benefit by the increased blood supply brought locally.

At present, we are using a 1/10 percent mecholyl solution plus a saturated solution of glycocol, equal parts of each, 15 to 20 milliampheres of positive current; treatment time, twenty minutes.

No constitutional effect has been experienced. Laboratory findings show that there is retention of creatin and creatine. Locally the possibility of burns must be avoided by using two thicknesses of the asbestos sheet, in order to insure the metal electrode not touching the skin surface.

Philadelphia, Pennsylvania.

The cases under treatment and care of Dr. L. F. Bender and Dr. R. L. John have shown subjective and objective improvements. Cases of muscular dystrophy, which were hospitalized with rest in bed, glycocol-mecholyl iontophoresis administered daily, showed greater improvement than those patients who were in the out-patient department and coming in for treatment once or twice weekly. In addition to the iontophoresis treatment, Dr. Bender also administers 5 to 15 grams of glycocol by mouth daily.

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Report of the Committee on the Present Status of Physical Therapy[1]

The original report of the Committee was written ten years ago,[2] at the time of the organization of the Council on Physical Therapy of the American Medical Association. At that time there were certain conditions in the realm of physical therapy that threatened its ethical standing with the profession as a whole. Many new pieces of apparatus had been introduced and many overenthusiastic statements had been made and published by those who were becoming addicted to an untried machine therapy. The original report sounded a warning concerning the abuses of physical therapy and then presented the Council's suggestions for an ideal relationship between physical therapy and other branches of medicine. The Council's predictions have been so nearly achieved and the status of physical therapy in the field of medicine today is so much improved and so firmly established on a sound basis that the Council now feels that a new report on the present status of physical therapy is necessary.

"Physical therapy" is the term employed to define the treatment of disease by various physical means. It comprises the use of heat, massage, exercise, light, water, electricity, and mechanical and other physical agents.

The use of these physical agents has become thoroughly established as an integral part of medical practice. However, knowledge concerning the exact physiologic effects, therapeutic usefulness and technic of application of many of them is still limited. Physical agents should not be used by the physician unless he is thoroughly familiar with the source of the physical energy he is using and with the effects which it will produce. The use of these therapeutic devices empirically, simply to produce psychologic effects, is to be strongly condemned.

As in its previous report, the Committee desires to warn the profession as a whole against the acceptance of enthusiastic statements by manufacturers' agents—salesmen absolutely untrained in medical science. While the Committee feels that, for the most part, the sales agents of manufacturers of physical therapeutic equipment are no less trained and no more overenthusiastic than the representatives of many drug and surgical supply houses, nevertheless physicians are warned particularly against the high pressure type of salesman of physical therapy equipment who extols his device in terms of its earning ability. Choice of such devices should be based solely on the decision as to their therapeutic efficacy.

In its previous report the Committee pointed out that, although physical therapy came into its legitimate place in medicine during the World War, it is one of the most ancient methods of therapy. At the time of this previous report, now several years ago, the Committee stated that physical therapy was gradually taking its place with the usual medical and surgical procedures. Today we may say that it has assumed its correct position in ethical medical practice and has become a definite part of modern medicine. The Committee desires to reiterate, however, that unless we guard against bad habits in its usage, against allowing it to replace careful diagnostic measures followed by well defined but less spectacular methods of treatment, and, especially, unless we guard against its insidious tendency to make its master an easy living, physical therapy may lead into dishonest practice or quackery.

The solution to the development of legitimate physical therapeutic practice has been found in the organization of the numerous departments of physical therapy in the hospitals of this country. Just as the physician, while he may do some of the simpler laboratory tests in his office, uses the clinical laboratory for more difficult tests, so does he utilize the hospital's physical therapy department for many of the more elaborate physical therapeutic methods of treating disease, even though he may desire to use some of the simpler physical therapy measures in his own office.

Among the physical measures that have been found both by clinical experience and by laboratory research to have certain therapeutic value when appropriately prescribed may be included: (1) heat, in the form either of hot packs, hot water bottles, electric pads, radiant heat

[1]Report of the Council on Physical Therapy, reprinted from Journal of American Medical Association, August 22, 1936.

[2]Report of Committee on Present Status of Physical Therapy, Journal of American Medical Association, 87: 1302 (Oct. 16) 1926.

lamps, diathermy and short wave diathermy, hot baths, hot compresses, hot sprays and a number of combinations of electrical, radiant and hydrotherapeutic measures for producing heat, or of artificial fever produced by hot air, hot water, high frequency currents and other physical means; (2) massage, such as stroking, kneading, percussion, friction and vibration, as well as stretching, pulling and corrective movements; (3) therapeutic exercise, including passive or relaxed movement, assistive movement, active movement, active resistive movement, corrective and therapeutic games and training in correct body mechanics; (4) hydrotherapy, including thermal packs, douches, sprays, baths, contrast baths, whirlpool and other special baths, under water exercise tanks and therapeutic pools; (5) radiant energy, either natural such as in heliotherapy or sunlight therapy, or artificial, such as is produced by air and water cooled mercury arc lamps, carbon arc lamps, radiant heat lamps, infrared generators and other special devices for the production of various forms of artificial irradiation including radium and roentgen rays; (6) electricity in the form of galvanic, faradic and sinusoidal currents and high frequency currents (conventional and short wave diathermy); (7) mechanical measures utilizing pressure and suction machines and mechanical hydrotherapeutic and electrical devices, and (8) occupational therapy, both functional and nonfunctional forms, giving exercise by both diversional and purposeful types of work.

In its previous report the Committee stated that physical therapy was in a transitional stage and that it was "still violently condemned in toto by some physicians." Probably the best indication of the progress of physical therapy within the past few years lies in the fact that such a statement can no longer apply. There are few, if any, physicians who condemn physical therapy in toto in these days. The physician should no more condemn physical therapy in toto than he should condemn internal medicine, surgery, orthopedics or roentgenology in toto. While physical therapy is still in a transitional stage as far as its establishment as a recognized field of regular medical practice is concerned, nevertheless this transition has progressed within the past five years toward the point of complete consummation.

The Committee previously suggested that physical therapy should be considered as an adjunct to other forms of treatment, both medical and surgical. The Committee now wishes to suggest that, whereas physical therapy is a smaller and less developed field than either medicine or surgery, and whereas frequently the use of physical measures is merely an adjunct to other forms of treatment, it is possible to conceive of instances in which the use of some physical measure will be the primary method of treatment and medical agents or surgical procedures may be the adjunct. In other words, physical measures should be used only when and as indicated either primarily or secondarily in relation to other methods of treatment.

The previous report also dealt rather extensively with the use of physical therapy by charlatans and quacks. Our present report need not take so much cognizance of this angle. Nevertheless there are charlatans who practice in all fields of medicine and the idea should be abandoned that scientific physical therapy bears a stronger relationship to quackery than do other branches of medicine. The Committee feels that it must still sound a warning against overenthusiasm and exaggerated claims for the value of newly developed physical methods of treatment of disease. The present hyperenthusiasm concerning short wave diathermy and concerning positive and negative pressure machines is a case in point. At the present moment there is a trend toward overenthusiasm for the use of short wave diathermy and there is a similar wave of hyperenthusiasm for the use of positive and negative pressure machines in the treatment of circulatory diseases. Each of these measures appears to have a definite, though limited, field of usefulness, and each is being threatened with extinction because of the danger of a reaction against unwarranted claims. The Committee desires to sound a plea for carefully controlled clinical studies on the use of such devices before results are published in the literature. Ethical manufacturers, it is hoped, will heed this warning and develop their devices on the substantial ground of scientific fact rather than haste to compete with a myriad of fly-by-night concerns.

At the time of the organization of the Council, overenthusiasm on the part of certain physicians concerning ultraviolet therapy, combined with the high pressure salesmanship of certain manufacturers, had literally swamped physicians' offices, hospitals and many private homes with all kinds of ultraviolet lamps, some effective and some worthless. It took the Council at least four years to clear up the ultraviolet situation. Finally, by rejecting many of these ultraviolet lamps and by listing the few diseases really benefited by ultraviolet, and by developing standards for advertising ultraviolet lights, this form of physical therapy was brought into its present ethical position. We must avoid overenthusiasm for all new physical therapy apparatus, lest we have a duplication of the ultraviolet fiasco.

In its previous report the Committee pointed out that "The Council on Physical Therapy feels that the following points must receive the most careful consideration of the medical profession: (1) Physics, physiology and biochemistry must be called on to dispel the empiricism of the past and to demonstrate scientifically the value of various physical agencies." The present committee is aware that there has been a great deal of work done in these fields during the past five years which has aided in dispelling the empiricism of the past but is still of the opinion that this point should be stressed. "(2) Physical therapy must be recognized as a definite part of medicine, to be practiced and controlled by graduate physicians. It should be used only as one of the triad of medicine, surgery and physical therapy. It should be prescribed only after careful physical and laboratory examinations of the patient have been made. It should never be prescribed except by a physician thoroughly trained in the use of physical agencies."

The present committee desires to elaborate this statement by suggesting that, according to present day conceptions, rather than occupying one corner of a triad, physical therapy is situated at one corner of a many sided geometrical figure bearing a relationship to all the medical specialties both major and minor which appear at the other corners of this figure. Further, the very fact that it does bear a relationship to so many of the medical specialties emphasizes its value to medicine as a whole. According to our present ideas the statement that adequate physical and laboratory examinations should be made prior to the administration of this form of therapy should be accepted by every modern physician and applies equally to all phases of medicine. Emphasis has been previously made that physicians should be thoroughly trained in the use of physical agencies. There is need, however, for further education in this field, not alone through the medium of the undergraduate medical schools, but also through postgraduate education at

medical centers and through various medical societies and medical journals.

In its previous report the Committee stated: "The treatment of disease, whether by drugs, surgery or physical agents, belongs solely in the realm of medicine. A physician would not refer a patient to a non-medically trained technician for treatment through drugs or surgery, yet many physicians refer patients to technicians—masseurs, gymnasts or nurses who have not received training in physical therapy, or even to members of various cults for physical therapeutic treatment. . . . Therefore physical therapy must be recognized as a component part of medicine and patients requiring this type of treatment should be referred only to physicians trained in this specialty. In this way the use of these methods by charlatans will be largely eliminated."

The present committee desires to elaborate on this portion of the previous report by commenting that there are ethical technicians in the field who work in various hospitals and institutional departments under the direction of physicians, and occasionally as technical assistants to physicians specializing in the field. The Committee feels that just as ethical nurses work under the supervision of physicians and as laboratory technicians work under the supervision of a physician in charge of the laboratory, so well trained physical therapy technicians thoroughly imbued with medical ethics are logically of value in conducting the mechanical details of the administration of physical therapy under the supervision of a physician.

At this point the Committee desires to urge that all hospital departments of physical therapy be under the direction of a physician, and that the frequent practice of placing a medically untrained technician in charge of such departments be abandoned. The Committee realizes that the supply of well trained physicians in this field is limited, but it nevertheless feels that the rule should be adhered to in principle and that proper steps should be taken to provide the necessary graduate education in physical therapy for physicians. The technicians to serve under these physicians should be either graduate nurses or graduates of recognized schools of physical education and in either case they should have had an additional year's training in a recognized school of physical therapy. The Council on Medical Education and Hospitals has prepared a list of approved schools for physical therapy technicians. The need for such technicians is manifest and their training should be encouraged, provided it is understood that they are to work under direct medical supervision.

The present committee concurs fully with the last portion of the previous report: "(3) Since physical therapy is a definite part of medicine, every medical school should give a thorough training in this subject. The paucity of postgraduate and undergraduate instruction in physical measures in our medical schools has placed the profession at a disadvantage. Many attempts have been made to remedy this situation. A subject as intricate as physical therapy requires more study than the acceptance of a salesman's assertion that the snapping of a switch or the pressing of a button will definitely assuage any pathologic condition.

"The making of physical therapists by courses of one or two weeks often reeking with commercialism must be condemned. The three to six weeks' courses sponsored by reputable medical schools are frankly makeshifts but do serve to show the breadth of the subject; at least they effect the realization that such a period suffices only for establishing the purely mechanical details of technic and the broader physiologic groundwork on which, aided by his medical knowledge and common sense, one may attempt to erect a physical therapeutic superstructure. The remedy is adequate instruction to undergraduates in the medical schools. Courses starting with biophysics should be given in the last three years. In the postgraduate schools more intensive and prolonged courses should be offered. Medical societies should invite physicians specializing in physical measures to give sane, scientific courses in physical therapy to the members. A fair proportion of the scientific programs of medical societies should be assigned for discussion of physical measures of treatment."

In commenting on this section of the previous report the present committee desires to point out that, although the activities of the Council have practically wiped out commercial courses and that there has been considerable increase in the amount of postgraduate and undergraduate instruction in physical measures, there is still great need for further development along these lines. The Committee on Education of the Council on Physical Therapy has aided considerably in the postgraduate instruction of physicians through the medium of various medical societies by providing a group of well trained speakers who are available to the chairman of any medical society's program committee. It has further increased the knowledge of the general practitioner by providing a series of motion pictures on various phases of physical therapy. These are available without charge for use by any ethical group of physicians. The fact that physical therapy is receiving more attention in the medical literature is obvious to any one who glances through the current journals or the *Cumulative Index Medicus* and compares these with a journal or a volume of the *Index* published five years ago. For example, in the April 4, 1936, issue of *The Journal of the American Medical Association* the words "physical therapy" appear in articles, announcements, committee reports, advertisements and so on no less than seventy-nine times.

In its previous report the Committee announced that the Council would "attempt to keep the profession informed of the extensions and limitations of therapeutic value of old and new methods and of the efficacy and danger of apparatus offered to the profession and the public by the manufacturers." The present committee desires to announce that the second edition of the Handbook of Physical Therapy, a collection of approved articles on various phases of physical therapy, previously published under the auspices of the Council, is now available through the American Medical Association. It also wishes to bring to the attention of readers a booklet listing the apparatus accepted by the Council on Physical Therapy. This will serve as a guide to the practitioner in the purchase of physical therapy equipment and may be obtained by writing the Secretary of the Council on Physical Therapy, 535 North Dearborn Street, Chicago.

The Committee feels that since its previous report the status of physical therapy in its relation to general medicine has improved considerably, that there is a better understanding of the field as a whole by physicians at large, and that the activities of the Council on Physical Therapy in its attempts to disseminate reliable information on this subject have been well rewarded. There is still a need, however, for fuller cooperation between investigators and physicians engaged in clinical fields, on the one hand, and, on the other, the small group of physicians trained in physical therapy who are attempting to place this branch of medicine on a more scientific basis.

The Physiotherapy Review

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The American Physiotherapy Association is now entering its sixteenth year. When we consider its comparatively recent beginning and the tremendous developments that have taken place in these few years, we cannot fail to be interested and impressed. We must feel a great debt of gratitude to those who have guided this association so wisely and to the whole group of members who have cooperated to make this a professional organization of high standing.

In 1921, this association was organized with 30 members, Reconstruction Aides who had served in the Army during the War. Today we have a nation-wide organization with 815 members. During these fifteen years, the high ideals and standards of the original group have never been lowered, but the size and scope of the association have increased remarkably. There are now nineteen chapters with 542 members, 189 members at large, and 84 junior members, scattered from the Atlantic to the Pacific and even beyond. At present there are only nine states in which we have no members.

One of the important developments is the official publication. From a small magazine, first published in March 1921, *The Physiotherapy Review* has developed into a magazine whose standard is recognized by members of the medical profession and by others interested in physical therapy. Its circulation extends to the far parts of the world.

There are now many schools for the training of physical therapists. It has been an important function of the Education Committee to establish standards for these schools, to hold conferences with the heads of schools and with others interested in this field of education, and, in every possible way, to stimulate a high standard of excellence for training in physical therapy.

We are now a well-known and well-established organization. Recently one of our members has been appointed to serve on the General Advisory Committee for Crippled Children under the Social Security Act. We are glad to have a part in helping to establish the right kind of physical therapy in this new field.

The Executive Committee feels the great responsibility that has been placed upon it for the ensuing two years. It wishes to serve this association well, to be of service to the individual members, to the association at large, to members of the medical profession and to the various professional organizations whose interest coincide with those of the American Physiotherapy Association. Feeling that an association must be well coordinated to be of greatest value, the Executive Committee urges the cooperation and interest of all members, whether in chapters or at large, to the end that we may continue to grow and to develop in accordance with our heritage.

The Crippled Child

The Social Security Act, parts 1, 2 and 3, under the title V, provides funds to the states to extend and improve services to crippled children especially in the rural areas; provides medical, surgical, corrective and other services; provides for facilities for diagnosis, hospitalization and after-care for children who are crippled or who are suffering from conditions which lead to crippling.

It is of interest to note that Dr. Robert Lovett of Boston was the first to realize the problem of the rural child and in 1914 he organized work in Vermont for the after-care of the children afflicted with infantile paralysis. He was also the first to realize the need for workers particularly trained in this field. As there were no physical therapy courses at that time, nurses and graduates in physical education were trained in his office on the fine art of massage and muscle reeducation. Today we have many fine schools and courses to provide what Dr. Lovett knew in 1914 was absolutely necessary for the welfare of the crippled child,—trained physical therapists.

We of the American Physiotherapy Association have long known the need and have long served the crippled child. We rejoice that it is now being made possible for all crippled children, and for those who this year and next year may be victims of infantile paralysis, to be given opportunity for adequate medical, surgical and after-care and thus be able to go to school.

It is the duty of every physical therapist to be familiar with the law in her state concerning the care of crippled children. In many states physical therapy is still not well understood.

In 1926 during a hearing for the crippled children's bill in Wisconsin, a lone physical therapist appeared for the bill and to explain what physical therapy was and to answer questions concerning it to those interested in its passage. No doubt a similar situation exists in many states today.

We as an association have a definite responsibility to be sure that each child needing physical therapy is either supervised or treated by an adequately trained worker under the direction of a qualified orthopedic surgeon.

It is not a question of employment but a question of service to the child, and the issues should never be confused. We should feel proud of the years that we have faithfully fought the battle for the crippled child and should welcome this opportunity to assist in the development of a finer plan for the welfare of the crippled child. There is no group who have been any closer to the crippled child and his problems save of course the orthopedic surgeon who during these many years has given so generously.

Know your state law, and how and if it is functioning.

Notices

The Council on Physical Therapy of the American Medical Association published in October 1936 a classified list of apparatus accepted by the Council. A short summary on the application of the type of apparatus is given preceding each classification, and the date of acceptance is also given.

This pamphlet is for free distribution and may be obtained by writing to the Secretary of the Council on Physical Therapy, American Medical Association, 535 North Dearborn Street, Chicago, Illinois.

The Chicago Chapter is sponsoring a series of lectures by Dr. D. N. Buchanan of Billings Hospital, Neurology Department. Dr. Buchanan is giving a neurological analysis of the spastic child with the physical therapist's point of view in mind.

It is with interest that we watch the development of the Ohio Chapter. We feel the coordination of the whole state is a splendid thing and one which will give them strength.

Following is the program of the *Ohio Chapter* of the American Physiotherapy Association, *Semi-Annual Meeting, Cleveland, Ohio, October 17, 1936:*

MOUNT SINAI HOSPITAL
1800 East 105th Street

MORNING SESSION:

9-10 A. M. Registration—Fourth Floor Out-Patient Department.

10-12 A. M. Physiotherapy Clinic—Demonstration of Cases by Physiotherapy Departments of Lakeside, Charity, and Mount Sinai Hospitals.

LUNCHEON—12:30 P. M.—Wade Park Manor

AFTERNOON SESSION: WADE PARK MANOR

2:30 P. M. "Early Motion in Elbow Fractures"—Rudolph Reich, M. D., Chief Orthopedic Surgeon—Mount Sinai Hospital.
"Neurologic Principles in the Treatment of the Spastic Child"—J. L. Fetterman, M. A., M. D., Clinical Instructor Nervous and Mental Diseases, School of Medicine, Western Reserve University.
"Physiotherapy and the Growing Child"—Carl C. Francis, M. D., Department of Anatomy—Senior Instructor—Western Reserve University.

4:00 P. M. Business Meeting

OBSERVATION AND READING—Every Physician will make, and ought to make observations from his own experience; but he will be able to make better judgment and juster observations, by comparing what he reads and what he sees together. It is neither an affront to any man's understanding, nor a cramp to his genius, to say that both the one and the other may be usefully employ'd, and happily improv'd in searching and examining into the opinions and methods of those who lived before him, especially considering that no one is tied up from judging for himself, or obliged to give into the notions of any author, any further than he finds them agreeable to reason, and reducible to practice. No one therefore need fear that his natural sagacity, whatever it is, should be perplexed or misled by reading. For there is as large and fruitful a field for sagacity and good judgment to display themselves in, by distinguishing between one author and another, and sometimes between the several parts and passages in the same author, as is to be found in the greatest extent, and variety of Practice. . .

A man may practice . . . . all the days of his life, and yet be never the wiser for his experience, if he neglects to make the proper observations which that experience might suggest to him; . . . whereas the searcher of authors has the benefit of other men's experience together with his own; and it is from the joint-concurrence of these, that we can hope for any considerable advancement in knowledge.

—*John Freind, M. D.*

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ABSTRACTS

John S. Coulter, M. D.

Treatment of Atrophic Arthritis

Clinical Lecture at Kansas City Session

W. Paul Holbrook, M. D., and Donald F. Hill, M. D., Tucson, Ariz., in Jour. A. M. A. 107:1:34, July 4, 1936.

Atrophic arthritis is a constitutional disease which manifests itself as a profound systemic disturbance and by a chronic deforming polyarthritis. It should be clearly understood at the beginning that atrophic arthritis is a disease without a known single specific etiologic agent and likewise there is no single specific cure. In a previous paper one of us reported carefully-controlled experiments with various types of therapy. This consisted of placing a large group of patients with atrophic arthritis on a general program which included dietary correction, bowel management, prevention and correction of deformity, rest, exercise, general physical therapy, and climatic residence. After a control period of several months one group had foci of infection removed, another group was given blood transfusions, the third group was given vaccine of various types, and the remainder were given special forms of heliotherapy. Progress was observed over periods ranging from months to years. The results of this study emphasized the nonspecificity of any single therapeutic agent used and the necessity of using a comprehensive program of management.

Therapeutic Procedures

General.—From the case history it will be seen that the treatment of atrophic arthritis can be clearly divided into two parts, constitutional and local.

Diet and Nutrition.—Nearly every type of diet has been tried in atrophic arthritis. It is our experience that the patient does best on that diet which would be selected for him if he had no arthritis. If the patient is under weight, a full high calory, high vitamin diet with no limitation of starches is given. A bland, semi-bland or high roughage diet is used according to the patient's individual needs. Obese patients are given low starch and low fat diets for reduction in weight. In short, the patient's general condition should be considered, his gastro-intestinal tract studied and a suitable diet prescribed.

Bowel Management.—Many patients with chronic arthritis worry constantly regarding toxic poisoning from the colon. Physicians in this country in particular have fixed on the toxic colon as a ready explanation for the persistent arthritis after the patient has been relieved of all surgically removable organs. It is true that the colon may be the seat of chronic infection but there is little justification for the many appliances, irrigations and antiseptics used in the colon to combat "toxic poisoning." Adequate intestinal elimination is important and should be secured without the use of drastic cathartics. A simple lubricant, proper diet, abdominal exercises, massage, and habit time are usually sufficient. Tincture of belladonna and hot wet packs to the abdomen after meals are also of much help in selected cases.

Removal of Foci of Infection.—If removal of foci is to be of value in the treatment of this disease, it should be accomplished early. It is during this phase, however, that the procedure may be most hazardous.

Vaccines.—No single phase of treatment is more controversial than the use of vaccine in atrophic arthritis. Our results failed to show any better results in the group receiving vaccine than in the groups not receiving it.

Transfusions.—We have given a large number of blood transfusions to patients with atrophic arthritis. Patients with relatively acute or subacute arthritis respond well and often dramatically.

Fever Therapy.—In the treatment of atrophic arthritis, fever therapy has been disappointing. In a series of fifty patients who were given fever treatments, no patient was rendered symptom free.

Foreign Protein Injections.—Injections of typhoid vaccine intravenously and various nonspecific proteins have been used for a number of years in the treatment of arthritis. We have discontinued all such injections, particularly the protein shock therapy, except in the occasional young well-nourished individual whose disease is not acute. We have seen a number of patients who have had a rapid spread of the disease following this type of therapy.

General Physical Therapy.—There is at present a widespread belief that a department of physical therapy must be equipped with several kinds of lights, bakers, a variety of electrical appliances, paraffin baths, and other appliances. It is true that most of this apparatus can be used with some benefit to the patient psychologically and physically. However, 85 percent of our physical therapy requires only a thoroughly trained personnel. Postural correction, assistive exercises and the teaching of corrective exercises constitute the major work in the physical therapy of atrophic arthritis. All this can be done with no apparatus at all. Motion should be limited to within the painless arc but pushed to the limit with some assistance. All exercises must be done slowly and easily with a rest interval. The maintenance of muscle tone and of maximum joint motion depends on wisely-directed daily exercise. Massage and heat are much abused procedures. If used vigorously in the early stages of the disease, increased pain and soreness will result. If used wisely over muscles in the more chronic phase, it relieves muscle spasm and increases circulation. Active exercises of muscle groups are much more effectual and replace masage as soon as the patient is able. No attempt will be made to discuss the various mechanical and electrical appliances used in the physical therapy of atrophic arthritis as they are too numerous. Finally, it should be emphasized again that joint motion and muscle tone can best be secured by teaching the patient to help himself.

Prevention and Correction of Deformity.—Flexion contractions and deformities that occur in this disease

are making thousands of invalids yearly. In every patient with atrophic arthritis the possibility of residual deformity in all involved joints should be anticipated and prevented. If flexion contractions are present they should be corrected at the earliest possible moment. The prevention of such deformities may be accomplished quite easily but their correction is more difficult. The deformities usually occur in flexion, particularly in the knees, hips, elbows, wrists and hands. Unfortunately, the patient develops the worst possible bodily posture. He lies in a bed that sags, and he places pillows under his knees and head. The hands, wrists and elbows lie flexed across the body. Such flexion deformities are increased if walking is allowed with bent knees or hips.

Climate.—We have observed a large number of patients with atrophic arthritis during their residence on the Tucson desert. Acute exacerbations of the disease are exceedingly rare. The incidence of atrophic arthritis among native whites and Indians is extremely low. Rheumatic fever is a medical curiosity. A large group of children have been sent to the Tucson desert because of recurrent rheumatic fever. Of this group not a single child has had frank recrudescence of the disease during the past eight years of observation. Activity of rheumatic fever has been evaluated by means of fever, white count, sedimentation of the red cells, electrocardiogram and clinical observation. Again it must be said that the ideal climate is not a panacea for atrophic arthritis, but when utilized as a part of the constitutional management there is little doubt that it influences the disease favorably.

Chronic Arthritis, a General Disease Requiring Individualized Treatment

Ernest E. Irons, F. A. C. P., Chicago, Illinois; in Ann. Int. Med., 9:12:1658, June 1936.

Before passing to the problems of chronic arthritis it is of interest to recall that much acute arthritis is clearly related to infections and occurs as a part of the general infectious process. Frequently the causative organism, such as gonococcus, streptococcus or pneumococcus, is demonstrable in cultures from the infected joints. The number of joints involved, however, is remarkably small when considered in relation to the number of times that bacteria must reach joint structures in the course of the demonstrated bacteriemias of infectious diseases. Furthermore, the infected joints usually heal under appropriate treatment and rest, without residual impairment of function. We may conclude that the cartilage and other joint tissues of normal persons are fairly resistant to infectious insults.

This suggests that when joints fail to heal, and the arthritis passes into more chronic forms, factors other than the initial infection, such as inferior cartilage, impaired blood supply and nutrition, may be concerned in the disease.

Causes other than infection, such as serum disease, hemorrhagic diseases, as well as trauma, may also initiate arthritis. The parallelism noted between the acute arthritic phenomena of serum disease and the exacerbations of arthritis in rheumatic fever can be readily extended to some of the acute exacerbations of chronic arthritis which follow acute respiratory infections.

The concept of chronic arthritis as a general disease, rather than one of the joints alone, is steadily gaining ground. It is generally conceded that there are many initiating and contributing causes of chronic arthritis. These include infection, trauma, the wear and tear of use, heredity, disturbances of vascular supply or of general and local nutrition, metabolic and glandular dysfunction and the degenerative changes of advancing age. Various combinations of these causes and conditions in individual patients result in varying clinical pictures, whose common factor is involvement of joints and structures attached to the bony skeleton. No one single cause or condition is common to all cases of arthritis.

Atrophic (proliferative, rheumatoid) arthritis occurs in the younger age groups, often in women, and is characterized by multiple joint involvement with fusiform appearance of joints of fingers, often ulnar deflection, and later ankylosis. The onset is either insidious or acute, and evidence of initial and often of continuing infection is frequent. In many patients constitutional effects with slight fever, anemia, and poor nutrition are marked.

Hypertrophic arthritis begins on the average somewhat later, or beyond middle life, in persons often well-nourished, and causes disability from slight to severe crippling. It is usually polyarticular but may be monarticular. Lipping of joints, and hyperostoses are frequent; ankylosis is rare. Fibrous thickenings, Heberden's nodes with later bony hyperplasia at the terminal joints of the fingers are common. The effects of the trauma of work are often noted in the hands and spine of the laborer. Evidences of infection are much less frequent than in the atrophic form and when discovered, their removal influences but little the course of the arthritis. Arthrosis, which has been suggested to replace the term arthritis of this type, has at least the virtue of being less committed to the inflammatory concept.

Treatment

Some patients have been benefited by each of the remedies exhibited but, as might be anticipated, no one remedy has proved to be curative in a large proportion of groups of patients so selected.

No two patients present the same combination of symptoms, nor are their problems to be met in exactly the same manner. Different combinations of causes may result in arthritis of essentially the same type, although certain causes undoubtedly tend to be associated with one or the other type. The type of arthritis which will develop depends on the age, nutrition and kind of tissues of the patient.

Rest for the patient as well as for his joints heads the list. In many cases this means rest in bed. Removal of causes of worry and apprehension in so far as this can be accomplished in these times of unrest is as essential as physical repose. Elimination of infection is of first importance in many, and will contribute to the improvement of still more patients.

A well-balanced diet, including eggs, milk, meat, fruit and vegetables, affording full caloric requirement, with ample protein and fat is important especially in atrophic arthritis. In the obese, reduction of weight will give relative relief from trauma to weight-bearing joints. Reduction of carbohydrates may at times decrease local swelling and distress of joints. A diet excessively high in sugar and starches, frequently adopted by patients invalided with arthritis, is undesirable also because it is likely to be deficient in proteins, fat, and vitamins and contains insufficient residue to provide for efficient elimination. An abundant fluid intake will promote elimination by the kidneys and bowel.

Most of the drugs specially devised for the treatment of arthritis have not justified the claims made for them. Vaccines as a routine treatment are as ineffective as are certain of the widely-heralded drugs.

In addition to measures taken to remedy general

anemia and malnutrition of the patient, local treatment to improve nutrition and circulation in the joints is required. Heat, dry and with moist packs, combined with gentle massage increases local blood supply. The degree of active and passive motion to be employed is to be determined in each case, with the necessity of gentleness always in mind. For these purposes, simple appliances and those improvised in the home are desirable. In the past year we have been treating the cold clammy extremities of atrophic arthritis with negative pressure by means of the Pavaex machine. The skin temperature is increased, and in the small group of selected patients so treated the joints have improved.

Chronic arthritis, especially in its advanced stages, requires skilled orthopedic care. Much may be accomplished in correction of deformities and improvements of posture of the arthritic. More important still is treatment earlier in the disease, to prevent deformities and contractures. If ankylosis is unavoidable, positions of joints most serviceable to the patient should be secured.

In spite of the present popularity of vitamins, it would seem that much of the reputed necessity for vitamins may be obviated by moderate attention to the maintenance of a balanced diet including the conventional articles of milk, fresh fruits and vegetables, eggs and meat. In so far as there is probability of an unavoidably incomplete diet or lack of sunlight, the vitamin deficiency may be supplied in form and amount necessary for the general welfare of the body. There is still some doubt as to the wisdom of supplying this or that vitamin in large doses for the cure of disease of the joints.

The patient with arthritis is best treated not as one of a crowd, but individually, with reference to his own special problem of general as well as local disease.

Pain in the Shoulder Girdle, Arm and Precordium Due to Cervical Arthritis

Samuel S. Hanflig, M.D., Boston, in Jour. A.M.A., 106:7:523, Feb. 15, 1936.

This paper is concerned with the study and treatment of a group of cases in which with the exception of one, the outstanding symptom was pain in the vicinity of the shoulder girdle and arm.

Clinical and Pathologic Correlation

The clinical features of arthritis of the cervical spine are these: Rigidity is present, and its extent varies with the degree of muscular spasm, the extent of ligamentous ossification and the presence of osteophytes or hypertrophic changes. In the acute or infectious variety, the rigidity is due to muscular spasm. In more advanced cases, ligamentous ossification is the cause. In far advanced cases, the osteoarthritic or hypertrophic variety, the rigidity is due to osteophytes growing at the margins of the vertebral bodies and on spinous and transverse processes.

Another clinical feature is pain. It may be local pain due to the strain to which the inflamed parts are subjected while the spine is called on to maintain correct erect posture without support. On the other hand, the pain may be referred along the sensory nerves of the limbs or trunk. This pain may be due to pressure on the posterior nerve roots as they emerge from the spinal cord through their bony outlet. This pressure may be due to one or more causes. In the infectious variety, the roots as they emerge may be involved by adhesions or pressed on by inflamed ligaments and capsules. In the hypertrophic variety, reference of pain may be due to the pressure of osteophytes with their associated soft tissue inflammation and synovial thickening.

Symptoms may vary, depending on the degree of mechanical interference with the roots as they emerge from the cord. If the interference is slight, paresthesias and numbness may be the only symptoms. Pain of a more severe sort along any of the sensory or segmental nerves is the inevitable sequence of a more definite impingement. The distribution of pain and sensory disturbances varies with the particular nerve root or roots involved. The mechanism of reference of pain to the precordial areas as a result of irritation of cervical roots has been suggested by Nachias (1934). The medial anterior thoracic nerves originate in the eighth cervical and first thoracic spinal segments. The lateral anterior thoracic nerve originates in the sixth and seventh cervical segments. These innervate the pectoralis major and pectoralis minor muscles. These are motor nerves and do not carry any skin sensory fibers. These nerves, however, can possess protopathic sensations so that an irritation of them may produce a diffuse yet definite pain referred to the terminal portion of the nerve. There may even be muscle incoordination, loss of position sense, or even absence of reflexes and paralysis of the flaccid variety if the anterior roots of the spinal nerves are sufficiently involved.

Treatment

The treatment of this disorder, although essentially constant, may vary in its sequence and duration with the activity and acuteness of the arthritic changes. If the arthritis responsible for the pain is of the acute variety it is desirable to splint the neck either with a Thomas collar or with constant head traction using a Sayre's sling.

If the arthritis is subacute or chronic, and this is the usual type, stretching and manipulations are indicated in the manner hereafter described. An overhead hook into which can be attached a block and tackle Sayre's sling suspension apparatus is needed. The patient is seated on a chair under the apparatus. If the patient is apprehensive, it may have been advisable to prescribe a sedative. The Sayre's sling, well padded at the chin piece and occiput piece, is applied. Traction is applied and is continued until the patient's buttocks swing freely, when rocked, just above the seat of the chair. While the patient is suspended in the air, the shoulders are held by an assistant, and the head and Sayre's sling are rotated to the left and right. The patient is then lowered and rested for a moment or two, and then the entire procedure is carried out again.

A Thomas collar is made and applied, to be removed only for the hot fomentations to the neck that follow each treatment.

It has been customary to carry out this treatment three times the first two days, twice a day thereafter and then spaced out as seems advisable. The number of treatments varies tremendously and is determined by the progress of the disorder. Similarly the period of wearing the Thomas collar varies. In certain cases it may be dispensed with.

As soon as the pain begins to go, active graded exercises in rotation, flexion and extension are advised. The patient is advised to return at stated long intervals for inspection, at which time occasional neck stretchings and manipulations are advised if any recurrence of pain or increase in limitation of motion is observed.

This treatment can be used as a diagnostic test, because in most cases in two or three days there is be-

ginning relief of pain. It is effective as a treatment, probably because it mobilizes adhesions, breaks up bridging of fine calcifications, and relieves muscle spasm, thereby contributing to a better carriage of the cervical spine.

Manipulative Surgery

By T. McW. Millar, M.B., F.R.C.S.E., Assistant Surgeon, Royal Infirmary, Edinburgh; Assistant Surgeon, Chalmers Hospital, Edinburgh; in The Clinical Journal, LXV:9:371, September 1936.

Manipulation is a method of treatment which has long been neglected by the medical profession.

Selection of Cases for Manipulative Treatment

The first essential for the successful treatment of any condition is correct diagnosis, and this holds for manipulative treatment. Every effort must be made to make an accurate diagnosis, and every aid must be used when necessary. In particular, no manipulation should be carried out without a careful x-ray examination and a careful scrutiny of the films.

Contra-Indications to Manipulation

In general, forcible manipulation is seldom necessary in children, and "grey hairs and stiff joints" are a bad combination from the manipulative surgeon's point of view. It is never safe to manipulate a tuberculous joint, even when the disease is believed to be healed. In rheumatoid arthritis there is little scope for safe and successful manipulation. In osteo-arthritis, however, there is a limited field for manipulative treatment, particularly in the early stages before deformity has occurred. Increased mobility can be obtained, and pain relieved, by careful manipulation, probably because the painful limitation of movement which occurs even in an early stage is due rather to periarticular fibrotic changes than to destructive changes in the articular surfaces. Treatment in such cases may be followed by a considerable reaction with temporary increase of symptoms, and the manipulation should be such that this reaction is not excessive. The presence of gross limitation of movement, due to bony or fibrous ankylosis, to mechanical blocking by mal-united bones, traumatic osteomata, exostosis, osteophytes, etc., renders the case unsuitable for manipulative treatment. In a similar category are those cases in which the adhesions are dense and strong. Attempts to mobilize a joint in the presence of such adhesions may end in a fracture instead of the rupture of an adhesion.

Finally, the presence of a neurosis, while it complicates matters, is not by any means an absolute contra-indication. Most neuroses have an organic basis, and, provided this is of a nature amenable to manipulations, the latter may produce a brilliant cure of both the organic and the functional condition. On the other hand, the average compensation case with an element of neurosis does not as a rule yield very good results, because the essential co-operation of the patient in the after-treatment is so often absent.

Technique of Manipulation

Manipulation is an art, and skill in it can be acquired only by practice and experience. The force required is often considerable, but it must be applied with discretion. It must be varied to suit the case, and will depend on the strength of the adhesions, the age and build of the patient, the strength of the bones, etc. In many cases the bones in the neighborhood of a stiff joint are atrophied from disuse. Leverage is used in nearly all manipulations, the lever being either long or short according as the limb is grasped far from or close to the joint. Short leverage is advised for routine use, as the bone is endangered by the use of a long lever. Manipulation in stages is much better and safer than attempting to mobilize completely a very stiff joint at one sitting—a procedure which, by producing a severe reaction, often defeats its own ends.

Anesthesia is not necessary in all cases, but is frequently essential. Osteopaths and bone-setters seldom use anesthesia for their manipulations, but depend on their skill—and many of them are undoubtedly skilful manipulators—to defeat the patient's muscular resistance and get through with their movements. Anesthesia has the advantage of abolishing pain, and muscle spasm and resistance. It has the disadvantages inseparable from any full anesthesia, and full anesthesia is required.

With regard to the actual manipulation, it consists of something more than simply moving the joint as freely as possible in all directions. A certain sequence is laid down by some surgeons:

1. Tension is applied to pull apart the joint surfaces.
2. The joint is first put through those movements which are not under voluntary control; e.g., antero-posterior movement of the tibia on the femur.
3. The joint is put through full normal movements, certain movements being carried out in more than one position of the joint; e.g., rotation in the shoulder-joint, first in adduction and then in abduction.

Movements are usually sharp and decisive, and are carried out till the extreme limit of normal movements is reached, or till adhesions are felt or heard to give way. The surgeon soon becomes acquainted with the sound and sensation produced by the rupture of adhesions.

Manipulative treatment is valuable in chronic postural foot-strain, in chronic sprain of the ankle- and knee-joints, in stiffness of the shoulder-joint following injury, in certain affections of the cervical spine and of the lumbo-sacral spine and sacro-iliac joints.

Treatment by manipulation is not a method to be used indiscriminately or carelessly. Disaster may follow, as in the case of tuberculosis; dangers are run, such as fracture of a bone. Failures will occur, due to lack of care in the choice of cases, to inexperience, to fear of accidents and the consequent application of insufficient force, to imperfect relaxation and to inadequate after-treatment. In suitable cases, however, skilful manipulation can produce brilliant success, such as can be achieved by no other method.

Muscle and Tendon Injuries

Certain muscles and tendons are more liable to rupture than sprain; others to sprain than rupture. Tendons most commonly ruptured are the extenson communis digitorum (mallet finger), extensor pollicis longus, the long head of the biceps, the quadriceps tendon, and the tendo Achilles. Serious and permanent disability ensues if rupture of the tendo Achilles is not recognized and treated by early operation.

Common muscular sprains are "tennis leg" (a sprain of the calf muscles in the region of the musculo-tendinous junction and not a sprain of the plantaris, as has been commonly taught); "rider's sprain" (a sprain of the adductors of the thigh); "sprinter's sprain" (a sprain of one of the ham strings, commonly the long head of the biceps femoris); and "tennis elbow" (prob-

ably a chronic sprain of the origin of the common extensor). The treatment of these in the acute stage is massage, exercise, strapping, etc., and the avoidance of rest in the chronic stage manipulation.

Vascular Physiology and Clinical Medicine

By Eugene M. Landis, F.A.C.P., Philadelphia, in Ann. Int. Med., 10:3:290, September 1936.

The primary factors involved in a quantitative study of the movement of fluid through a membrane are: (a) the total area of filtering surface available; (b) the properties, particularly the permeability, of the membrane itself; and (c) the pressures exerted on the fluid both inside and outside the membrane.

The collective area of capillary wall available for fluid interchange is relatively enormous. Krogh estimated that the total surface of capillary wall in the body of an average-sized man must exceed 6,300 sq. meters or 68,000 sq. feet. In other words the total collective area of capillary endothelium in the adult human body can be visualized as a microscopically thin membrane three feet wide and over four miles long. In the capillary network one cubic centimeter of blood is exposed to a filtering surface of 7,300 sq. centimeters or over 7 sq. feet. Obviously very rapid interchanges are favored by areas of this magnitude.

In the second place, rapid interchange of water and dissolved salts is aided by the inherent properties of the capillary endothelium which is far more permeable than other living membranes so far studied quantitatively. Under comparable conditions water would pass through the frog's capillary wall three thousand times more rapidly than through the surface membrane of a typical cell and over one hundred times more rapidly than through the membrane of the human erythrocyte.

Quantitative studies of the third factor, namely capillary blood pressure, offer some technical difficulty. Capillary blood pressure has been measured by many indirect methods, no one of which is entirely free from criticism. The estimates of pressure thus obtained by different observers ranged from far below to far above colloid osmotic pressure.

Further development of micro-injection methods made it possible to measure the filtration and absorption of microscopically small volumes of fluid by single capillaries of the frog's mesentery. It was then found that the rate and direction of fluid movement through the endothelium depended upon the relation between capillary blood pressure and the colloid osmotic pressure of the plasma,—supplying direct evidence that the capillary wall acts as a passive, though highly permeable, membrane.

The development of simple thermo-electric methods of measuring skin temperature under standard conditions has made it possible to estimate deficiencies of blood flow and to differentiate the ischemia of vasospasm from that of obliterative arterial disease. Complete dilatation of structurally normal blood vessels elevates the skin temperature to levels which are constant enough to be used as a practical estimate of the maximum increase in peripheral blood supply that can be produced by suitable therapeutic measures. The diagnostic methods now available for producing temporarily maximal blood flow in the extremities are numerous,—novocaine block of peripheral nerves, general or spinal anesthesia, paravertebral injection of novocaine, or warming the body. If skin temperature can be elevated by any one of these methods to 30.5° C. or more, significant organic vascular occlusion is absent. The diagnoses to be considered are by this test limited to those conditions due principally to vasomotor disturbances.

If during a vasodilator test, skin temperature rises only to 26° or 27° C., structural disease of the arterial wall is present in a slight degree, and the organic vascular conditions must be considered. A partial vasodilator response reveals also that moderate arterial dilatation is still possible and considerable assistance may be expected from vasodilator agents, including heat, typhoid vaccine, drugs, and sympathetic ganglionectomy.

In advanced organic vascular disease the physiological variability of blood flow in the extremities may be almost or completely absent. At this stage abolition of vasoconstrictor tone fails to elevate skin temperature. Those therapeutic procedures which depend on vasodilatation cannot be expected to increase blood flow significantly. For treating patients with advanced organic vascular obstruction it was suggested simultaneously on physiological grounds by Landis and Gibbon, and on clinical grounds by Reid and Herrmann, that varying the air pressure about the affected extremity might aid blood flow by physical means.

Low Back Pain

Robert A. Milliken, M.D., Little Rock; in J. Ark. Med. Soc., XXXIII:2:35, July 1936.

The treatment of the postural cases is sometimes startlingly easy, sometimes it tries the patience of everyone to the limit. Obviously the treatment of a mechanical difficulty is mechanical, a correction of the mechanical error. First came exercises to strengthen the relaxed abdominal, dorsal and gluteal muscles. Where the factor of safety has been only slightly over-stepped, a surprisingly slight increase of muscular tone and change in the pelvic tilt will work wonders. Many cases need more than that, they must have rest for the underlying fatigue and rest for the irritated ligaments or periosteal areas; then, because few people can afford the necessary weeks in bed and must be up and doing, artificial support is needed—a back brace or corset. The immediate relief that many a case gets by the addition of external support is striking. Many cases need stretching of dorsal kyphosis, or drooping ribs, of flexed hips, before the muscles can get the body into the proper posture. So, then, these cases need exercises, rest, stretching and braces in various proportions and amount but always and forever exercises. One does harm rather than good by stretching without strengthening; bracing alone weakens; rest alone weakens.

Lastly, do not forget the feet. Footstrain may not have been the straw that broke the camel's back, but its removal will often relieve. The late Dr. Lovett used to say that posture begins at the floor. The bad foot mechanics and the bad back mechanics are interrelated and interdependent. We cannot cure the one if we ignore the other. One other point, measure the legs. A surprising number of backaches have been cured by adding a ⅜-inch lift to one heel.

Book Reviews

HANDBOOK OF PHYSICAL THERAPY. By Various Authors. Second Edition. Cloth. Price, $2.00. *Pp.* 436. *Chicago, American Medical Association,* 1936.

This second edition of the handbook, written by various authors, contains articles that have been adopted and authorized for publication by the Council on Physical Therapy of the American Medical Association. It represents the efforts of this council to separate the useful from the useless in physical therapy and to evaluate the various physical agencies and the methods of their employment in this form of therapy. This second edition has been thoroughly revised.

Each article is condensed and has had the advantage of the criticisms of all council members. The subjects considered are: evaluation of methods used in physical therapy; body mechanics and posture; the influence and therapeutic use of external heat; massage; therapeutic exercise; aids in muscle training; occupational therapy; hydrotherapy; sources of ultraviolet and infrared radiation; light therapy and roentgen therapy in tuberculosis; ultraviolet therapy in dermatology; radiotherapy physical characteristics of diathermy and short wave diathermy machines; medical diathermy; electrosurgery, treatment of skin diseases by physical therapeutic methods other than radiation; and colonic irrigation.

This book is the most critical and reliable book now available for students of physical therapy.

VASCULAR DISORDERS OF THE LIMBS. Described for Practitioners and Students. By Sir Thomas Lewis, C. B. E., F. R. S., M. D., D. Sc., LL. D., F. R. C. P., Physician in Charge of Department of Clinical Research, University College Hospital, London; Honorary Consulting Physician to the Ministry of Pensions; Consulting Physician, City of London Hospital; Fellow of University College, London. Cloth. Price, $2.00. *Pp.* 111. *New York, The Macmillan Company,* 1936.

This book is written and published in the same style as "Diseases of the Heart" by the same author. This work is not intended to be a comprehensive account of vascular disorders of the limbs, but is written for those in practice. Chapter one is on the circulation in the limb and its testing. It is a book really written for the student and does not give a number of complicated tests requiring special instruments. This is illustrated in the following statement on the method of gauging the state of blood flow by estimating skin temperature: "It is erroneous to believe that delicate instruments are necessary to detect differences of skin temperature. The practised hand when warm will detect small differences of temperature between various areas of skin with certainty; it will compare the temperature prevailing over larger surfaces of two arms or two legs more speedily than will any instrument; and speed is very important when, as is frequent, the temperature of the exposed limb is changing."

There are nine other chapters on effects of circulatory arrest; embolism and thrombosis of main arteries; post-ischaemic contracture, intermittent claudication; arteriosclerosis, thromboangeitis obliterans; vasoconstriction, local arterial spasm; spasmodic arterial obstruction, Raynaud's phenomenon; gangrene, bilateral forms; vasodilatation, flushing; and vascular disorders in diseases of the nervous system.

In the treatment of these various conditions there are many points of interest for the physical therapist. For instance, in the use of heat to increase the blood flow in arteriosclerosis it is stated: "Warming or heating a normal foot increases the circulation to it. When, however, the arteries to the foot are diseased, little or no increase of flow may be brought about, but it is quite certain that the warming or heating will increase the metabolism of the tissues and thus increase the blood-flow requirement. Thus it is apparent, on theoretical grounds, that a local application of warmth may do harm and not good, and experience bears this out." Lewis believes that the circulation to the feet should be increased by warming the subject's trunk and thighs; the warming of the feet should occur indirectly through increased blood flow, at least enough direct heating will occur by the passage of warm air from body to feet beneath the bed-clothes.

This small book is such a practical guide to the management of circulatory troubles of the limbs that it can be recommended as a necessary book to every physical therapist treating these conditions.

THE RELIEF OF PAIN. A HANDBOOK OF MODERN ANALGESIA. By Harold Balme, M. D., F. R. C. S., D. P. H., Formerly Professor of Surgery and Dean of the School of Medicine, Cheeloo University, China. Introduction by Sir E. Farquhar Buzzard, Bt., K. C. V. O., LL. D., M. D., F. R. C. P., Regius Professor of Medicine, University of Oxford, President-Elect of British Medical Association. Cloth. Price, $4.00. *Pp.* 392. *Philadelphia, P. Blakiston's Sons and Company, Inc.,* 1936.

Pain is the dominant symptom which induces the large majority of patients to seek medical aid, and to the suffering patient the alleviation of pain is imperative. The author emphasizes that the first essential in the relief of pain is a knowledge of its cause, and that the characteristics of pain often point the way to that knowledge. He also brings out the difficulty of estimating the importance of the psychological factor in an attempt to assess the severity of suffering in the individual who has the pain.

There are four parts. A list of the chapters shows the value of the book in meeting and attacking this daily problem of the relief of pain. Part one is concerned with the problem of pain and discusses the nature and pathway of pain, sensitivity to pain, pain and psychical phenomena, classification of painful sensations, and the investigation of pain.

Part two takes up the subject of general and systemic pain with chapter headings of the prevention of pain, pain from inflammatory disorders, from injuries, from diseases of the skeletal system, from diseases of the nervous system, of the circulatory system, and intractible pain. Part three discusses regional pain, and part four is devoted to the therapeutics of analgesia. Under the latter heading is an excellent chapter on rest and posture. Dr. Matthew B. Ray contributes a chapter on baths and packs and another on movements, massage, and electrical treatment. This book can be recommended to physical therapists as an excellent work on the subject of pain.

NEUROLOGY AND PSYCHIATRY FOR NURSES. By Frederick P. Moersch, B. S., M. D., Associate Professor of Neurology, The Mayo Founda-

tion, Rochester, Minnesota. Cloth. Price, $1.85. *Pp.* 104. *Minneapolis, Burgess Publishing Company,* 1935.

The subject of nervous and mental diseases has always been regarded as extremely difficult and complex. Textbooks dealing with neurology and psychiatry are as a rule voluminous and excessively detailed. The author of this manual for nurses has attempted to present the subject in a much simpler form, emphasizing those conditions which appear to be of the greatest importance from the standpoint of the nurse. Part one deals primarily with the anatomy and physiology of the nervous system and with organic or neurologic conditions. Several excellent diagrams are included to clarify the text.

Part two deals with psychiatry. The signs and symptoms of psychopathy are presented in simple Kraepelinian terms rather than in the difficult language of the dynamic school. Although the major psychoses are described very briefly, a reference list for additional reading is made available and should be utilized by those who deal with nervous and mental cases. The physical therapist will find in this manual those essentials of neurology and psychiatry which should serve as an adequate guide in understanding the commonly encountered problems in which the nervous system is involved.

THE MAYO CLINIC. By Lucy Wilder. Cloth. Price, $1.25. *Pp.* 82 *with illustrations by Ruth Barney. Rochester, Minnesota, The Bookshop of Lucy Wilder,* 1936.

The story of the Mayo Clinic is one which is truly a glorious chapter in the history of American medicine. The author of this delightfully written narrative is a resident of Rochester, Minnesota, and is well qualified to relate this saga. William Worrall Mayo came over to this country from England in 1845. In the small town of Rochester, Doctor Mayo laid the foundation on which was built the Mayo Clinic. With his two sons, "Charlie" and "Will," as assistants, this general practitioner established himself as the outstanding physician of the town and county and even at that early date was drawing patients from Iowa and the Dakotas.

The vision of this "country doctor" was carried to fulfilment by his two now famous sons, Charles H. and William J. Mayo. The story of the growth of the "Clinic," the establishment of graduate medical education through affiliation with the University of Minnesota, and the great service rendered to so many thousands by this fine institution is fascinating reading. "Going through the Clinic" is an experience always to be remembered by the patient who visits the Mayo Brothers. To one who has had any association whatsoever with the Mayo Clinic, this volume will be particularly instructive and entertaining.

THE PATIENT AND THE WEATHER. By William F. Petersen, M. D. Volume I, Part I. "The Footprint of Asclepius." Cloth. Price, $3.75. *Pp.* 127 *with* 94 *illustrations. Ann Arbor, Michigan, Edwards Brothers, Inc.,* 1935.

The author believes that the modern physician considering diseases quite ignores the primary element of the environment. Doctor Petersen is Professor of Pathology at the University of Illinois College of Medicine but believes that we think too pathologically and teach medicine as a science of death. He believes that the medicine that we must practice, the dysfunction which presents symptoms, is most frequently not associated with gross or microscopic tissue alteration, but rather with molecular and ionic alteration.

This book deals with the effect of the immediate environment, namely, the weather and the season, on the patient. The author has made use of the meterological changes because this environmental factor can be measured with considerable accuracy; it is the most important environmental factor from the time we are conceived to the time that we die; and it is thoroughly ignored in modern medical teaching and medical practice.

This volume is the first of a series of monographs that deal with meteorological influences on the normal person and on the patient. This is the introductory part of Volume I and presents a rapid survey of the field. Its purpose is to lead the reader back to Hippocrates. The title "The Footprint of Asclepius" is cleverly shown in the last illustration in which a large footprint closely corresponds to a schematic map of the United States to designate the regions of greatest meteorological demand on the organism.

This is a most unusual work, and it can be recommended to those interested in the patient and his reactions to the environment.

THE ART OF MINISTERING TO THE SICK. By Richard C. Cabot, M. D., and Russell L. Dicks, B. D. Cloth. Price, $3.00. *Pp.* 384. *New York, The Macmillan Company,* 1936.

In this volume the authors present the view that in a period of painful or incapacitating illness, religion has a definite place. They believe that often a patient needs something more than surgery or medicine to work a cure or alleviate physical suffering, and that encouragement and psychic therapy may not go far enough. Religion often supplies this need.

Religion should not be narrow and sectarian. The authors give examples of the effects of religion in establishing mental poise and happiness and thus at times having a beneficial effect on the physical ailment.

It is a volume that can be read with profit by those physical therapists treating severely disabled patients who so often need the encouragement that religion may supply.

The study of mineral waters, which greatly interested the physicians of the Renaissance, was especially cultivated at Strasbourg.—*FRENCH MEDICINE, by M. Laignel-Lavastine and M. Raymond Molinery.*

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